FEBRUARY, 1938
Vol. II. No. 9

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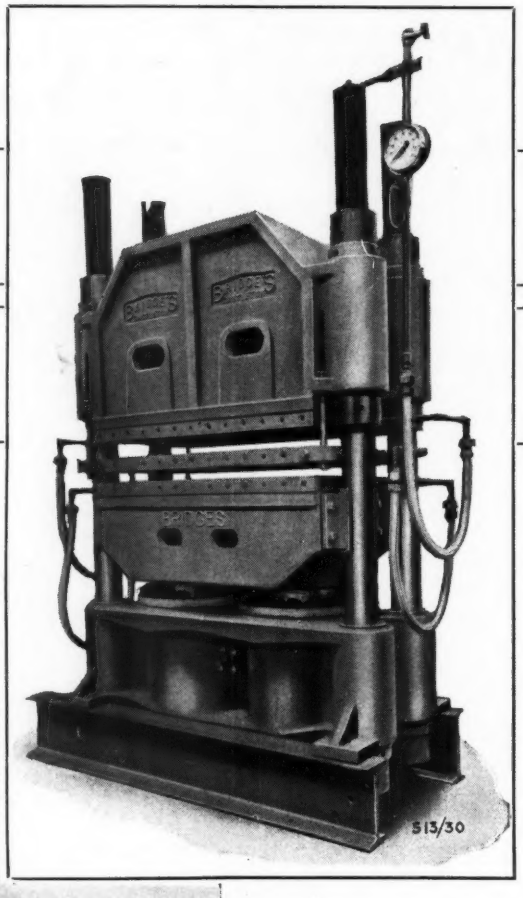

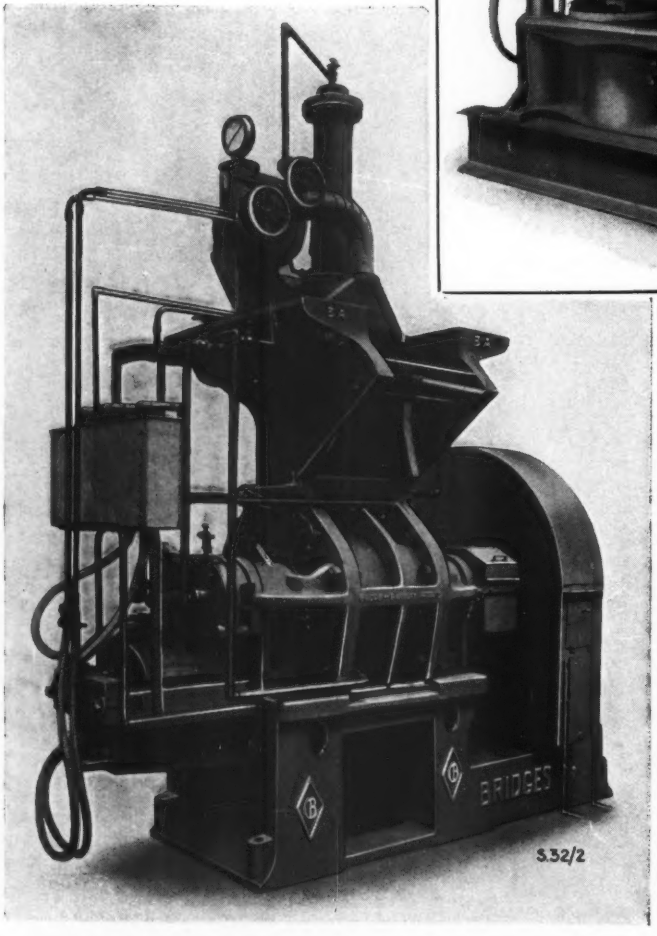

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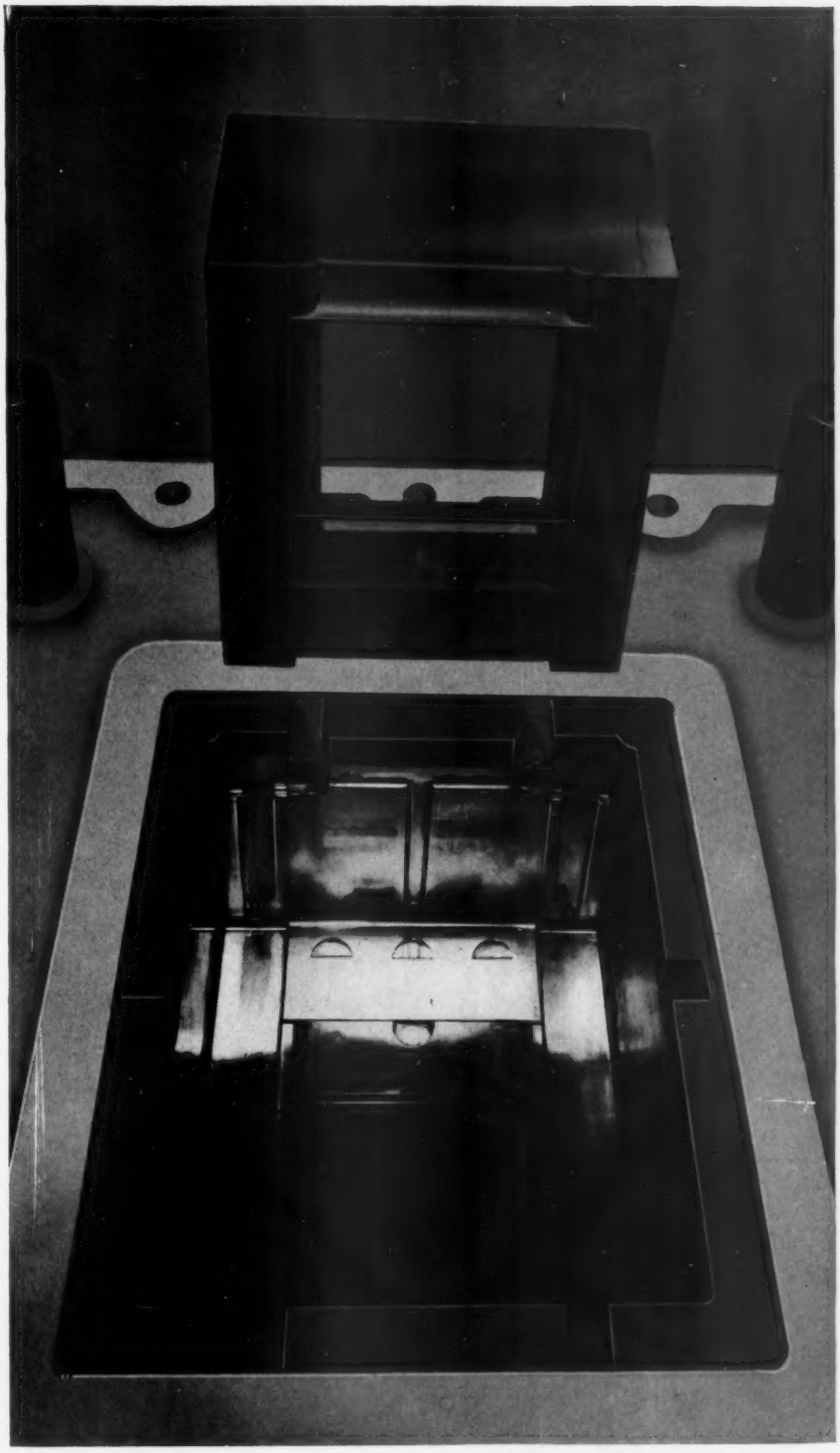

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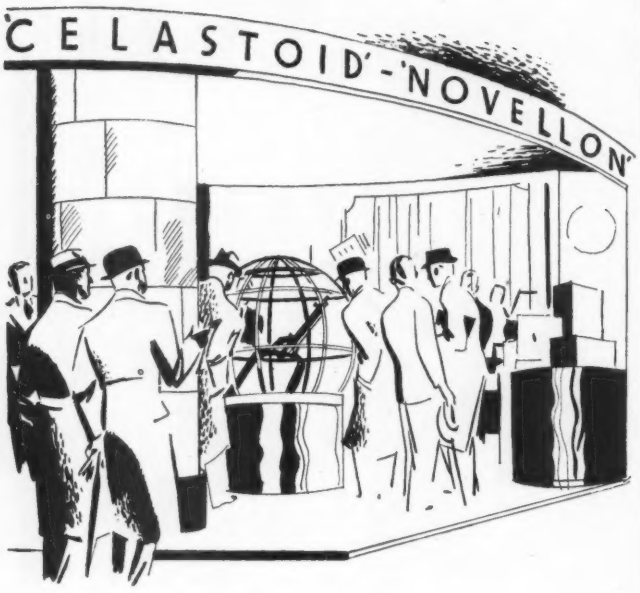

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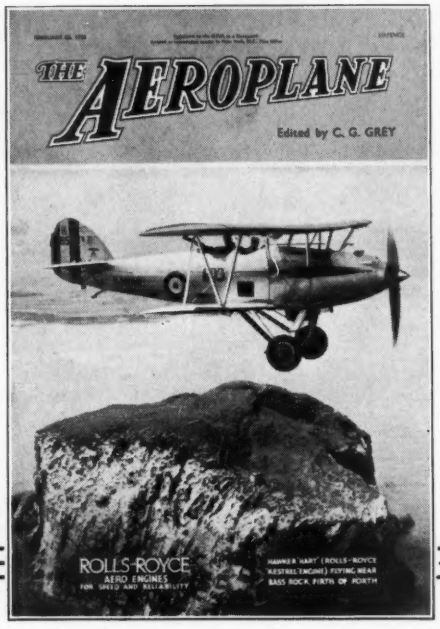

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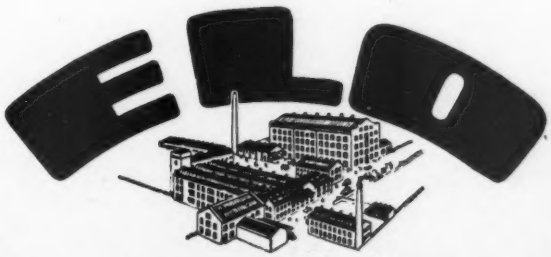

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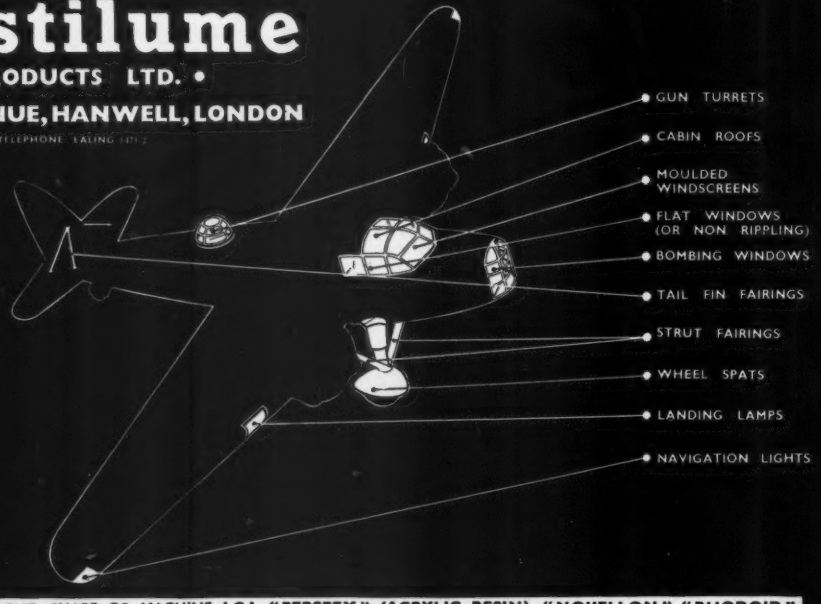

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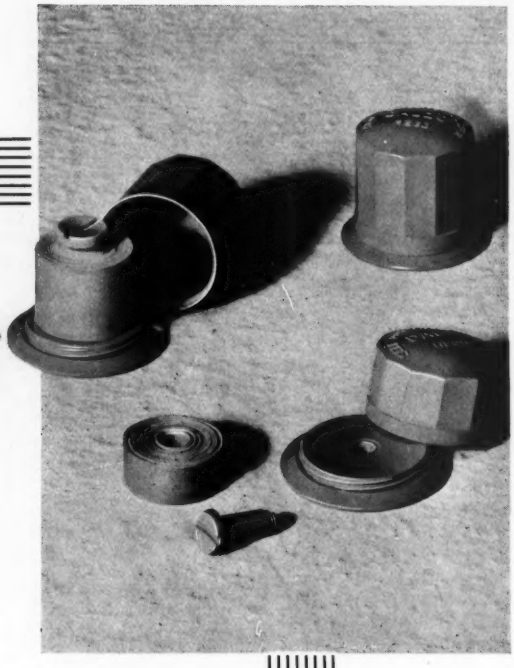

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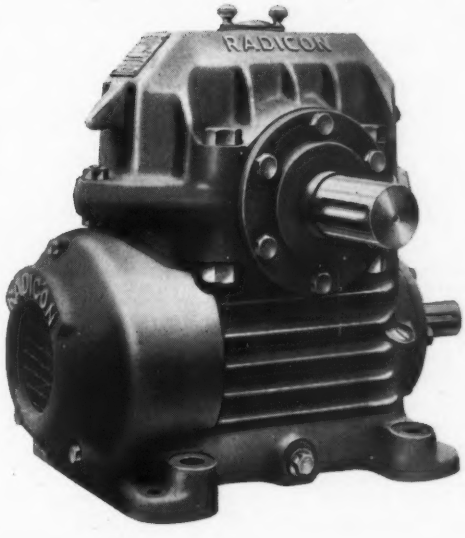

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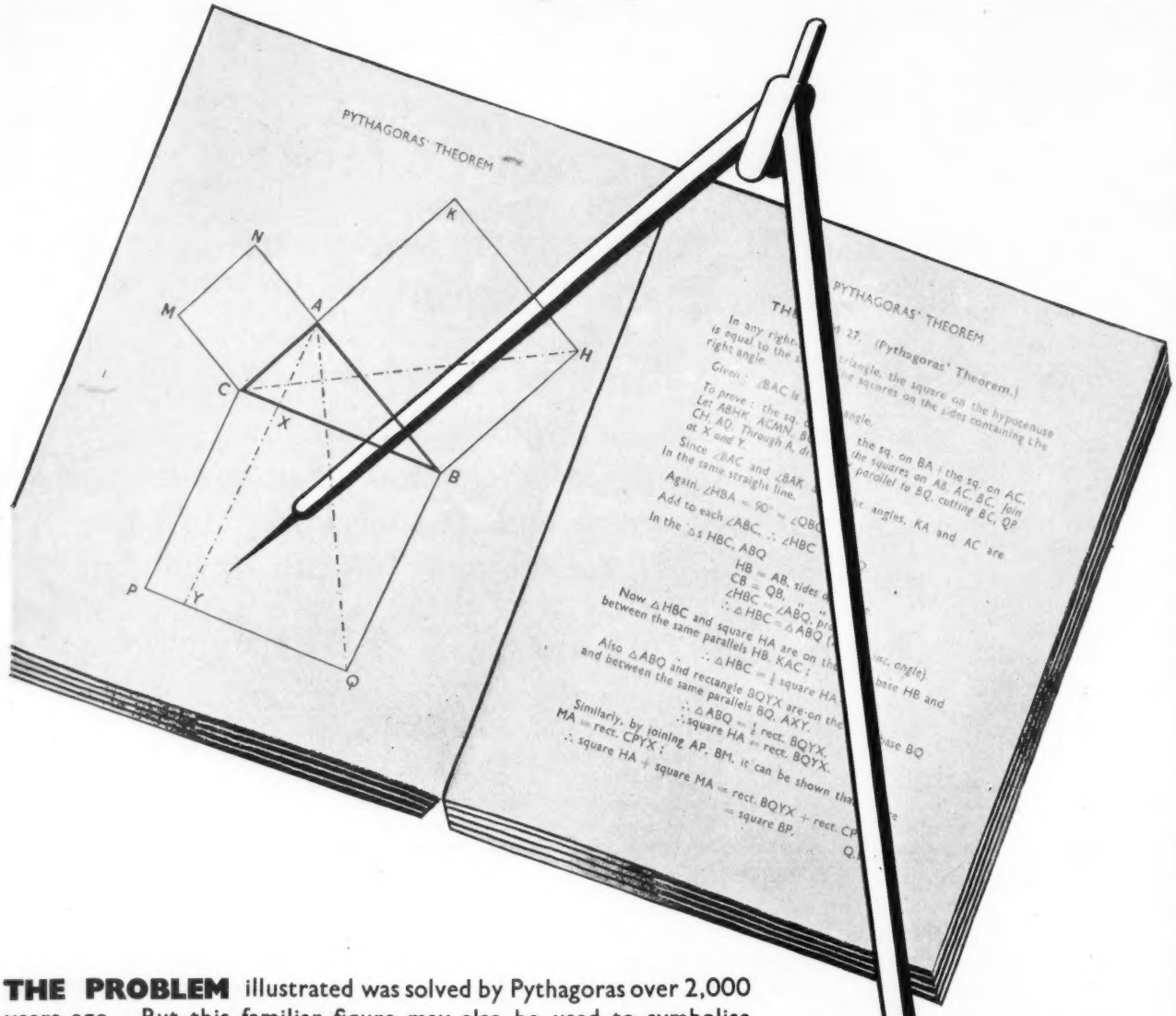

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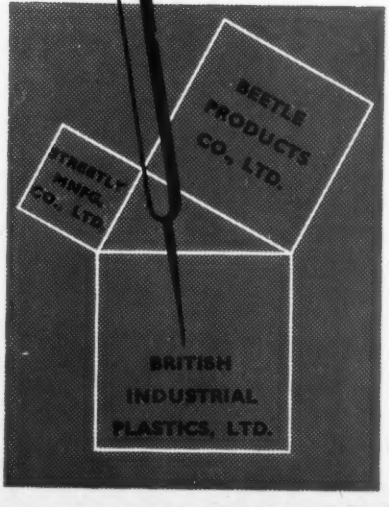

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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials.

Vol. II. FEBRUARY, 1938 No. 9

Index to Advertisers.

Adana .. .. xxii.
Ashdown, H. E. (Birmingham), Ltd. i.
Ashworth & Meredith, Ltd. .. .. viii.
Bakelite, Ltd. .. .. Front Cover
Beetle Products Co., Ltd. .. .. —
Birkbys, Ltd. .. .. v.
Bridge, David, & Co., Ltd. .. .. Inside Front Cover
British Celanese, Ltd. .. .. .. iv.
British Industrial Plastics, Ltd. .. xiv.
Brown, David, & Son (Hudd.), Ltd. ix.
Catalin, Ltd. .. .. xix.
Crystalate Mouldings .. .. .. xi.
Ebonestos Industries, Ltd. .. .. xx.
Erinoid, Ltd. .. .. Inside Back Cover
Firth, Thos., & John Brown, Ltd. .. iii.
Forbes Plastic Mouldings, Ltd. .. viii.
Gardner, Wm., & Sons (Gloucester) Ltd. xx.
G. M. C. Mouldings, Ltd. .. .. xviii.
Hamburger, M. .. .. xx.
Heywood & Bryett .. .. .. xiii.
Higgs, G. N. .. .. xxii.
Lorival Manufacturing Co. (1921) Ltd. —
May & Baker, Ltd. .. .. .. —
M.C.L. and Repetition, Ltd. .. .. xx.
Mouldrite, Ltd. .. .. xvii.
N. B. Mouldings, Ltd. .. .. .. vi.
Norcross Panel Plywood Co., Ltd. .. xxii.
Parker, Winder & Achurch, Ltd. .. xx.
Peall Roy & Co., Ltd. .. .. .. xxii.
Permastic, Ltd. .. .. xxi.
Phipps Signs .. .. xxii.
Plastilume Products .. .. .. vi.
Pulsometer Engineering Co., Ltd. .. xxii.
Ray Mouldings, Ltd. .. .. .. xiii.
Rootes Mouldings, Ltd. Back Cover
Sale, H. B., Ltd. .. .. xxii.
Steele & Cowlishaw .. .. .. xxi.
Streetly Manufacturing Co., Ltd. .. —
Technical Machines & Accessories .. ii.
Thomson, L., Ltd. .. .. .. xxi.
United Glass Bottle Mfrs., Ltd. .. xvi.

Announcements.

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Other notices appear on last page.

CONTENTS

	PAGE
Editorial	39
Old Craft of Marquetry Revived	41
Shaping Plastics from the Sheet	42
General Release—I	45
Colour Page	46
General Release—II	48
The Economics of the Plastic Industry ..	49
Constructions in Space	50
Dry Cleaners Would Welcome Plastics, by J. Bernard Argent	52
British Industries Fair, 1938	54
What Plastics Are: (6) Cellulose and its Derivatives, by H. C. Bryson	64
Rubber in the News	67
Is It Well Designed? by J. P. Gowland ..	68
Ideas, by the Editor	70

Production:

Notes and Comments	71
Furfural	72
Inquiries and Answers	73
Trade and Personal Notes	74
New Materials, New Plant, New Methods	75
Patents	76

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Vol. II. No. 9 FEBRUARY, 1938

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - 5-17, Rosebery Avenue, London, E.C.1

FAIRS AND FAIR THINGS

BRITISH INDUSTRIES FAIR, 1938! How fascinating it has been watching these fairs grow from the first hesitating and sketchy attempts at collecting in one vast hall exhibits representative of our great industries, technical and otherwise! How they have grown in sureness of method and in size until, to-day, they not only occupy Olympia and Castle Bromwich, in Birmingham, but are overflowing into Earls Court.

We remember, too, the first attempt, only a few years ago, to hold a combined plastics exhibit and the remarkable effect it had on visitors, especially foreigners, who had imagined the industry in this country to be quite negligible. It is pleasant to record that the B.I.F. 1938 will represent an industry with a capital of some £5,000,000; and, if we want startling figures, it is interesting to report that many manufacturers can say they have turned out 500,000 units of more than one object. One moulding company has manufactured 2,000,000 tooth-mugs for one customer!

What will be the most attractive characteristic of the Plastics Section?

Perhaps, first and foremost, it will be a feast of colours—of colours that outstrip by far the rainbow in variety, of fascinating transparencies and translucencies that no natural product can give.

Or it may be the almost incredible variety of uses to which these plastics are put and which will be displayed. Is there any industry that does not use them? For here are electrical goods for switchboxes and distributor covers; radio cabinets and television sets; table tops and door knobs that never need polishing and cannot be harmed, transparent window-screens for aeroplanes, cases and boxes for the fancy goods trade, truck-wheels that last longer than steel, display stands for window dressing, buttons and buckles, toys and games, tubes and rods for frames and towel rollers, artificial jewels and bottle caps. In the home and in industry, plastics seem ubiquitous.

Or, to the more technically minded, do they not represent a miraculous age wherein, in contrast to the older materials of construction, we can now more readily choose what is more suitable for our purpose? The objects that were so ponderous because they had to be made of metal, we fondly imagined the better because they were heavy! Is it not a miracle that we can now produce them in plastics which, although not stronger than steel, will last longer than steel under certain conditions, and yet be one-sixth the weight? We can now see into machinery without dismantling an opaque cover. Is that not a miracle? And withal we now have utility and beauty combined where beauty did not exist.

It is rare to note a visible change in any industry from one year to another, yet the change that has taken place in the plastics industry is not only visible but startling. With some truth it can be said that each and every concern in the trade has created something new or interesting. Some have made goods that never before were made in plastics and have thus created a new outlet; some have introduced new materials that were not available for the B.I.F. last year. We may mention a few that will now be seen by the public:—The transparent Beetle of British Industrial Plastics, Ltd., the latest laminated material of Bakelite, Ltd., the Perspex and Diakon of Mouldrite, Ltd., the Catalin of Catalin, Ltd., and the moulded lenses of Combined Optical Industries, Ltd., who have just erected a factory at Slough. The last two firms, indeed, are new to Olympia. All these and others are well worth seeing and deserving of your admiration.

At our own Stand No. A678 we have endeavoured in such space as we have at our disposal to show a comprehensive collection of the whole industry, not merely of the moulding trade but of other sections no less important.

To our readers in various categories we issue a special appeal to visit the Plastics Section. The general public will have a unique opportunity of seeing a comparatively new development "close-up," and will, perhaps, clear their minds regarding certain new materials which are often wrongly called "milk-products" or, as one journal called them still more curiously, "synthetic resins from Devonshire junket"!

We offer, too, a special welcome to outside industrialists, whom we feel sure will see in plastics new materials for their special consideration.

Research Laboratories

LAST month we had the special pleasure of attending the opening of the new research laboratories of the Dyestuff Group of Imperial Chemical Industries, Ltd., at Blackley, Manchester.

Nearly 20 years ago, soon after the war ended, and on exactly the same spot, we visited the comparatively small laboratories of the British Dyestuffs Corporation, Ltd. Then there was no visit by the Press—the outside world scarcely knew of them.

To-day British Dyestuffs Corporation, Ltd., is a subsidiary of Imperial Chemical Industries, Ltd., and the laboratories have grown and have been transformed with the growing demands.

In the intervening years we have followed closely the life of the whole company, and although our interest has been mainly journalistic we could not suppress a thrill at realizing in the laboratories the stature of the modern Colossus of the chemical industry. It seems strange that an outsider should be proud of these new buildings, but we do feel so. And we think that the whole nation should be anxious of the welfare and feel some pride, if not of possession, in the existence of these nationally important laboratories.

What do these and other research laboratories represent? Chemists, of course, regard them as the life blood of industry, as a bulwark against bad times, as a control of the many materials essential to our health and comfort, and to the hundred and one different industries that contribute towards our national wealth, and finally as a potential source of new ideas and new materials for the creation of yet unborn industries.

What have these Lancashire laboratories done in the past? Well, if we mention one thing only, it must be that they represent the energy and the brains that converted a state of affairs in which this country imported 90 per cent. of its dyes from Germany, into one in which we now manufacture and supply in this country over 95 per cent. of our requirements. Moreover, in them have been discovered dyes of such remarkable properties that other countries have asked permission to manufacture them. New chemicals for treating rubber have been discovered there, and synthetic materials resembling rubber but actually superior to it have been developed. New antiseptics, new anæsthetics and new drugs first found birth in them, and it is well to note mainly because of the already available technique and methods of research in dyestuffs.

Here the amazing pigment, Monastral Blue, that excited the world of colour some two years ago was first created. And, if we can now talk of our own industry, it was here that the modern miracles of science, Perspex and Diakon, the new synthetic resins more transparent than glass, were developed.

It is easy for a chemist when considering these or other big research laboratories to let his tongue or pen run away with him, but we fully believe it is time the nation realized their importance. We dare swear that had the coal industry considered coal as a suitable material for research 30 or so years ago there would have been no talk of Government control.

To return to Blackley. During our visit we were able to see some excellent exhibits of the work that has been done on plastics. Typical synthetic resins of the phenol- and urea-formaldehyde type were shown both in the powder form and as mouldings made from them by customers of the company. Also there were seen the Paralac resins, which are widely used in varnishes, and sheets and moulded goods made from Perspex.

The new laboratories are magnificent. They are planned to accommodate a hundred research chemists and their assistants, and are arranged so as to compromise between the more usual alternative plans of housing 20 or 30 chemists in one large laboratory, and of giving each worker a smaller laboratory to himself. In the system adopted four chemists share a large laboratory, so arranged as to give each a measure of privacy without completely isolating him.

We wish the new laboratories and their occupants the best of luck in their new endeavours.

Exhibition of resins for moulding, varnishes and other purposes at the new research laboratories at Blackley.

Old Craft of MARQUETRY Revived

TWO hundred years ago the Dutch marqueteurs excelled in what was then a comparatively new form of ornamentation on wood and metal. It consisted of cutting out very delicate and often intricate patterns in the panel or other material to be embellished, and inlaying various coloured woods, ivory, tortoise-shell and metals to build up conventional pictures. Marquetry became very fashionable in the 17th and 18th centuries, and the craft was widely practised by French and later English workers. Large panels to be used as screens were inlaid in the form of colourful pastoral scenes, and a good deal of work was also done on furniture, this being known as Intarsia. Even the hilts of swords, daggers and the barrels of pistols and muskets were elaborately ornamented with metal, tortoise-shell and mother-of-pearl.

Inspired by the work of the old masters, particularly Pierre Gole and Vordt, the famous Dutch marqueteurs, one well-known British firm has adapted marquetry to plastics with very interesting results. Mr. Walter Spradbury, the woodcut artist, and Mr. H. J. Dow, the industrial designer attached to the British Xylonite Co., Ltd., collaborated to translate marquetry into modern practice and adapt it to mass production. This proved by no means easy, as a method had to be evolved which lent itself quite readily to normal manufacturing processes and did not entail many expensive and lengthy operations.

The "Woodlands" set illustrated on this page is not really a true example of the old craft of marquetry, but it is certainly a most ingenious and, indeed, successful adaptation. Instead of the coloured portions of the design being actually inserted into a cut-out portion of the Xylonite blank, it is forced down into the material and made to form a close bond under heat and pressure. The blank and the design knit together, and so a completely permanent and most attractive ornamentation results.

Two or more colours are obtainable, and the design lends itself to many different kinds of presentation. Simplicity appears, however, to be the keynote of the most successful patterns, and the simple pastoral scene as shown on the back of the "Woodlands" set is a good example of a deservedly popular line. It was no lucky chance that a woodcut artist was chosen for developing patterns, as experiments undertaken by the company showed that simple patterns of the woodcut type were the most suitable.

The British Xylonite Co., Ltd., certainly deserve praise for their initiative in translating marquetry in Xylonite, and we look forward to further successes with other thermoplastic materials. It has been pointed out to us by Mr. Dow that this new form of decoration is by far the most permanent obtainable on Xylonite.

The 1938 "Woodlands" toilet set starts a new fashion.

General view of the workshops of Plastilume Products, Ltd.

SHAPING PLASTICS from the SHEET

Being a Short Description of the Works of Plastilume Products, Ltd.

THE manufacture from synthetic resin powders of the Bakelite or Beetle type of press-moulded goods which are quite infusible is, naturally enough, the backbone of the plastics industry. Within very recent years there has become possible, by means of what is known as the injection process, the use of the thermo-plastic type of material in powder form in which the finished goods, produced also in a mould, are fusible instead of being infusible. In this case the raw materials are powders made from cellulose acetate, styrol and acrylic acid resins, etc. The above two methods produce by far the greatest amount of the finished goods that appear on the market, the thermo-plastic moulded materials being confined to smaller articles, such as buttons, buckles, spectacle rims—in short, articles in which absolute rigidity is not essential or not desirable. Both methods are often employed in the same factory.

The planing machine.

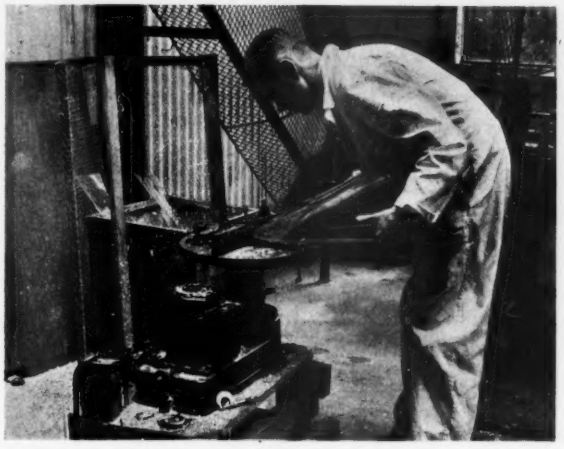
There is, however, yet another division of our industry which has often been called the Cinderella of Plastics. Cinderella, partly because, although in actual fact far older than the above moulding processes, the literature of plastics is almost devoid of any mention of it—of its methods or its products—partly because the public has never been informed of it in the same spectacular manner as have the Bakelite type of goods, and also because the technique involved in production is entirely different from ordinary moulding practice.

We refer to the shaping and forming of goods from sheet plastics, an industry that was well established long before the war, and is so specialized that the moulding industry do not undertake this type of work.

Originally, celluloid sheet was the only material available for this class of work, and from it were made a thousand different kinds of toys and other objects, from collars to dolls and ping-pong balls, and from soap containers to hair-brush backs. Unfortunately, the inflammability of celluloid detracted seriously from its otherwise admirable properties, with the result that after long research the non-inflammable cellulose acetate was discovered and has risen rapidly in importance. Within the last year or so this industry has received yet another recruit in the form of Perspex sheet, made from synthetic resin of the acrylic acid type.

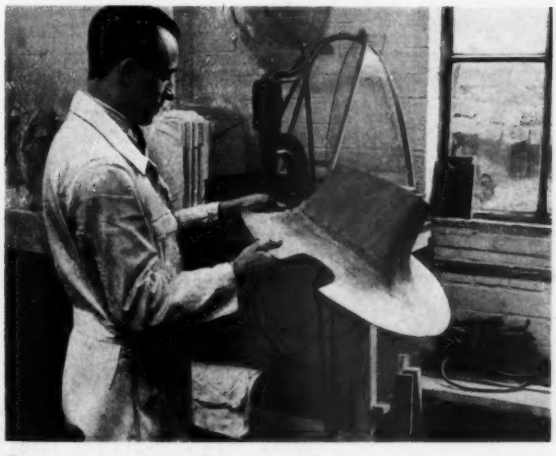
Cellulose Acetate and Perspex Sheet

With the passage of time there has also come an improvement in the type of material available—we refer not so much to quality as to what at first sight may seem relatively unimportant—we refer to increase of thickness of the sheet. Since celluloid was inflammable its use was definitely restricted to objects which, from price and other considerations, were constructed from very thin sheets.



Rebating or stindler machine. Rebating the edge of a wind-screen.

Sawing from the sheet. The paper interleaving is retained.



Riveting a strut fairing with linen covering.

The strain viewer. A sharp change in the colour of the transmitted light indicates a faulty structure.

One of the inspection and stamping tables.

When the non-inflammable acetate burst upon the market it was soon realized that the bonds which prevented expansion were greatly released, and that increase in thickness, which in all solid things gives greater total strength, made possible the production of what might be termed structural objects. The modern acetate and Perspex can be produced in sheets up to ¼ in. thick.

Thus we now have available an almost unbreakable and extremely tough transparent sheet (in the case of Perspex even more transparent than glass), which, moreover, when softened by the various methods utilized, can be cut into any design with a pair of shears. It is also rendered so pliable that when placed on a shape it will, with very little pressure and strain, take up that shape perfectly; finally, on cooling to room temperature it returns to the hard, tough and uncuttable condition while retaining its new form.

It is now common knowledge that in these new plastics we have at our disposal raw materials which not merely outshine glass because of their absence of

Landing lamps (frames and windows) ready for despatch.

brittleness, but which for technical reasons are preferable to glass in their ease of assuming shapes which are normally very difficult to manufacture.

Plastilume, Ltd.

It was some 10 years ago that Mr. Hutchinson, the managing director of Plastilume, Ltd., Ealing, foresaw the future that lay ahead in the development of industries based on these materials. The acetate industry, extremely small as a whole, was in the throes of developing the production of translucent coloured letters from sheet for advertising and similar purposes, but Mr. Hutchinson soon realized that there was ample scope beyond this. Opportunity soon came by co-operation with an aircraft company for the production of a transparent windscreen.

At this point it may be as well to bring out more fully one of the essential differences between sheet-forming and the moulding of goods made from resin powders. We have indicated that there is a great difference in the technique, but "technique" is scarcely the word to employ in referring to the sheet-forming industry, for there is far more handcraftsmanship than machine work. There is, moreover, a complete absence of what is commonly called mass-production, the process of formation of a large shape of ¼-in. thickness from the sheet occupies hours instead of the minute or two in the moulding process. Each new object to be made is a fresh job which must be carefully controlled at each stage.

This is especially important with aircraft work and since nearly the whole of the works of Plastilume Products, Ltd., are now occupied on work of this type (the company fabricates very large quantities of windscreens, gun-turrets, landing and navigation lights, cabin-roofs, etc., for the aircraft industry) there is rigid control of raw materials, all heating, shaping and cooling processes, and scientific examination of the final product.

The Process

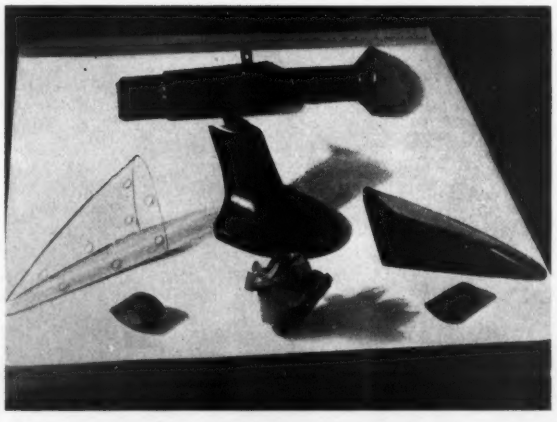
The size and thickness of the sheet varies according to the specifications of the job, but obviously from the point of view of requirement of strength, the larger the sheet the thicker it is. It is first placed in a softening chamber where it is softened very slowly. When the plastic state has been reached, the sheet is extremely pliable and somewhat soft, resembling the pliability and softness of rubber. In this condition it is rapidly cut with shears to a design more conformable to the desired finished shape and is placed on the "former." This "former," constructed of wood or other material specially treated, is in effect the negative. Here, in its plastic form and by gentle pressing and stretching, the sheet takes the exact shape of the "former." It is then allowed to cool slowly (upon the rate of both heating and cooling depends the production of a satisfactory material free from internal strain) until room temperature is again reached. The shape when removed from the "former" is now a strong rigid structure. Incidentally the whole process is covered by patents in all the principal countries of the world.

All that remains is the edge cutting, trimming, the grinding of the edge to make the structure fit into its destined place such as a window frame, and polishing.

Finally, each object made for aircraft structures must undergo a test to determine the presence or absence of internal strain. The apparatus employed is known as a strain viewer, the one used at the works of Plastilume, Ltd., being constructed by Adam Hilger, Ltd. It is by this means that a faulty piece is rejected.

As was indicated previously, the early activities of this company included the manufacture of letters for advertisement signs from the coloured sheet. Needless to say, this and sundry other activities still form an important part of the company's work. Since the sheet can be obtained in all colours and in translucent form, there is considerable demand in these directions by the theatre and cinema world where a relatively cheap yet robust and rapidly interchangeable letter or design is desirable.

In addition there are a large number of other types of objects which the company manufactures. For example, the Rawlplug advertisement shown in the last photograph was carried out in cellulose acetate in very large quantities. Imitation flowers in the same material are also made. An extremely interesting application of recent growth is also seen in the same photograph. We refer to the covering of all shapes of metal and wood with a cellulose acetate covering in many colours and thicknesses. The company holds the sole agency of this process for the aircraft industry for Resistoid, Ltd.



Various shapes from plastic sheet. Left and right foreground show wood and metal covered with cellulose acetate.

"General Release"—I

New and Interesting Plastic Goods

THE "Sandringham" line of toilet ware will appeal to all our women readers. It is made from Bexoid by the British Xylonite Co., Ltd., and is available in pink, blue and green.

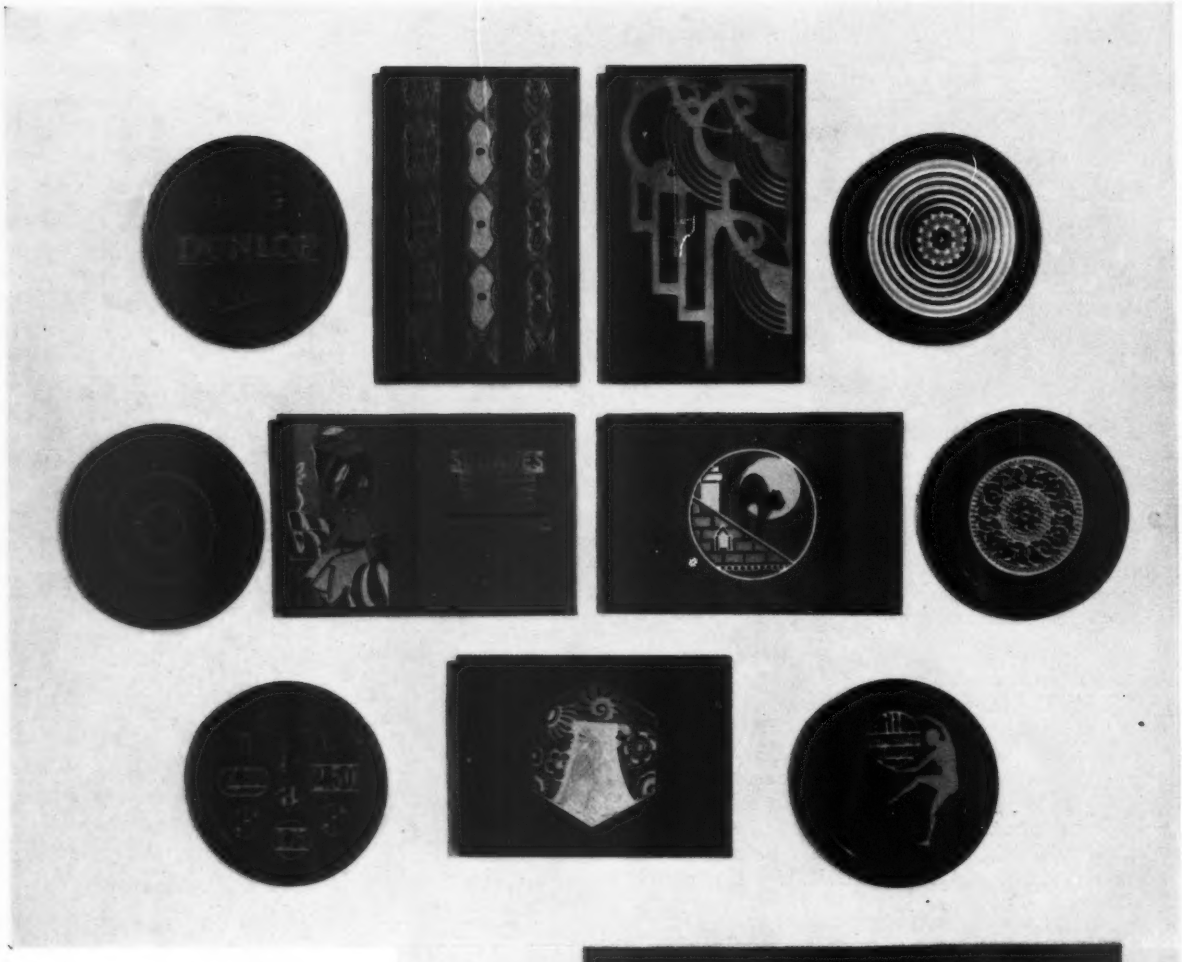
THE "Permanote" is the most ingenious writing pad we have yet come across. The writing surface of the pad lies flat in use, and to obtain a clean sheet all that is necessary is to turn the movable pad over by raising the lower end and applying a slight pressure. To refer back to notes, the knob has to be turned towards the writer. The material is phenol formaldehyde resin, and the manufacturers are G.M.C. Mouldings, Ltd.

WE recommend this dainty little Snow White outfit for any kiddy's birthday. Like the Playtime Set in the same series, it is moulded of amino plastics by the British Xylonite Co., Ltd.

THE advantages of cellulose acetate for lampshades are now being appreciated by manufacturers, and Messrs. Tucker and Edgar made good use of Rhodoid in the construction of those illustrated, which were designed by Ian Henderson.

WE have grown to expect first-class containers for Gibbs toilet products and the latest shaving stick comes fully up to expectations. The colours are white and brown and the material amino resin.

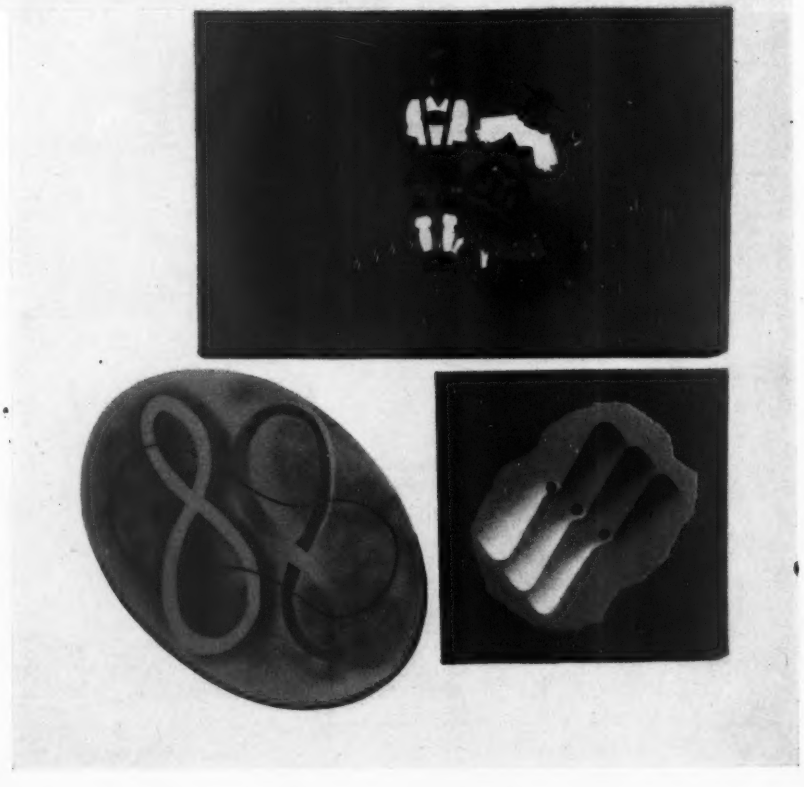
AN attractively designed and gaily coloured Playtime Set in the Snow White tradition, shows how British Xylonite Co., Ltd., are capitalizing the latest Disney feature film. The material is amino plastic and the colour range includes ten lovely shades from white to amber onyx.



THE top eleven examples are specimens of metal inlays on phenol-formaldehyde resin bases. The metal portion in some is of filigree work, but the hexagonal inlay shown is of enamelled metal in a solid piece

★ ★ ★

THE lower examples are resin impregnated paintings on a three-ply base some half-inch thick, and made by Bakelite, Ltd. The surface is highly polished, unscratchable, and cannot be attacked by most chemicals



IN our November issue we gave a preliminary notice of two extremely interesting and novel applications of plastics.

One referred to the utilization of metals with plastics for producing an attractive inlay, and we now have pleasure in producing, in colour, on the opposite page 11 objects which have been so treated. We feel sure that readers will realize that we have here a new method of producing decoration that will lend itself to many different purposes. In effect we have, in some instances, results closely resembling cloisonné ware or the very beautiful Toledo work in which gold is inlaid in steel.

The process of manufacture is relatively simple. The metal portion can vary in form from that of delicate filigree work roughly 1-100 in. thick to a fairly thick disc 1-32 in. thick. This is placed at the bottom of the mould, powder is added in the usual way, and pressure and heat applied. The technique is, as indicated, comparatively simple, but obviously special care must be taken to avoid movement of the metal strip and accumulation of powder on its face.

Of the examples shown, our readers will, no doubt, recognize their purport and their obviously French origin. The circular discs are about 3½ in. in diameter and are intended for the café-bar industry, in which the French have the delightful habit of not asking you to pay "on the nail." You can sip your glass of beer for hours. The disc is placed on the table, and on it is indicated the price of the drink. If and when your second is brought along you still do not pay, but a second disc is placed on the first. And so on—but not ad infinitum! One pays eventually for the pile. The rectangular shapes are lids of cigarette boxes intended either for the more expensive type of cigarette or for special Christmas presentation. These lend themselves to ready adaptation for jewel boxes as alternatives. For these specimens we are indebted to Inlay Mouldings, Ltd., of Ealing, London, W.

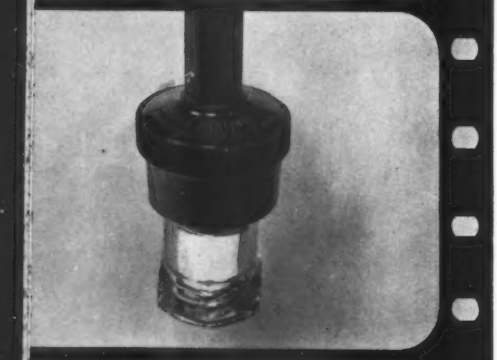
* * *

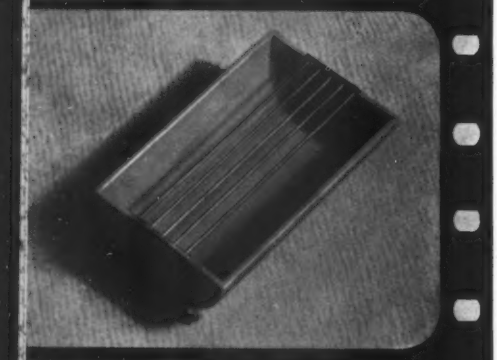
The three examples in colour photography shown at the foot of the opposite page are in quite a different category, and introduce a process which is so entirely new as to present a completely novel method of applying artistic design. Moreover, it renders the design virtually imperishable. Who knows but what at some future date the paintings of the New and, indeed, of the Old Masters may be treated in some such manner, and so banish for ever the nightmare of deterioration of valuable paintings in our art galleries.

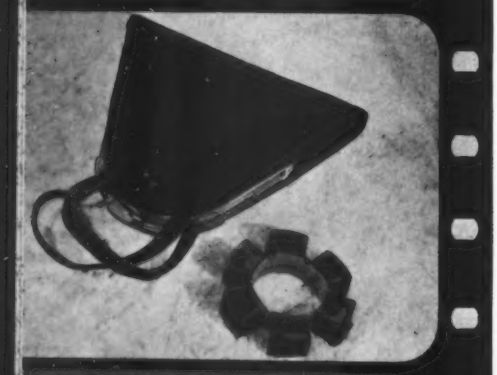
The process, as we indicated in our November issue, resembles closely that of producing laminated materials. The drawing or painting on paper or canvas is impregnated with a colourless synthetic resin. This latter is then "cured" under heat and pressure, and is then bonded to a stiff backing, such as three-ply.

At present, designs made in this manner are intended for decorative purposes on walls or tables in restaurants and bars, where the unique properties of the surface, resistance to alcohol and acids, washing and rough wear, lend themselves admirably for the purpose.

The examples shown in rectangular and oval shape are from 10 to 20 ins. wide, but the technique of the process obviously allows for the production of much larger units. We acknowledge with thanks the permission given us by Bakelite, Ltd., to reproduce these.







"General Release"—II

New and Interesting Plastic Goods

BOURJOIS, INC., of America, have introduced this new Shav Pak for the quality market. The container of Bakelite was specially designed so that when the Shav Pak is not in use the removable lid snaps firmly into place. Niagara Insul-Bake Speciality Co. were responsible for the moulding.

EVEN a barometer can be partly made by plastics, and this compromise is certainly interesting. Messrs. Griffin and Tatlock have drawn our attention to this new and inexpensive line which has a Bakelite moulding fitted over the top of the glass cistern holding the mercury.

THIS streamlined ashtray moulded of amino resin with a decorative chromium-plated metal grid shows to excellent advantage how metal can contribute to the smart appearance and usefulness of plastic mouldings.

TRANSPARENT Catalin contributes a great deal to the utility and attractiveness of this lady's bag. The design is modern, the finish extremely good and, thanks to the use of one of the most economical plastic materials, the price is very moderate.

NO! this is not a museum piece; just another example of what Catalin can do in the way of ornamentation and utility. There is no doubt that this lovely trinket box would be welcome on any lady's dressing table.

SOMETHING new in tablet containers is this new Durex vial moulded by Terkeslen Machine Co. for small tablets of the saccharin type. The device is opened and closed by turning about 45 degrees. The cap is not removed once the vial has been filled, but a slight twist brings the two openings in line and the tablet may be tapped out. Another twist and it is closed.

ECONOMICS OF THE PLASTICS INDUSTRY

IN a paper read to a joint meeting of the Society of Chemical Industry and the Institute of the Plastics Industry at the James Watt Memorial Institute, Birmingham, on January 14, Mr. H. V. Potter, managing director of Bakelite, Ltd., gave the results of a really scientific survey of the economics of plastic production. Commencing his address with a general classification of the industry, Mr. Potter divided it into four main groups:—

1. The raw material suppliers.
2. Plastic material manufacturers.
3. Fabricators of plastic articles.
4. Users of fabricated plastics.

The raw materials are supplied mainly by the chemical and allied industries, the former being now well established in this country since the war and no longer in the precarious position of 1914. It is exceptionally well organized and represents an invested capital of well over £100,000,000 and employs some of the best brains, both technical and commercial, in the country. According to the Board of Trade Census of Production for 1935, the products of the chemical dyestuff and drug industry total £67,000,000, and, according to Mr. Potter, it would not be over-optimistic to look forward to a turnover of about £100,000,000 for the year 1937, and an increase in personnel of about 10,000.

Turning to the plastic material manufacturer, Mr. Potter considered that the production of plastic material is a chemical and chemical engineering problem; a problem of working out the conditions of the reactions and the transference of such conditions into a works scale production, along with the designing of suitable plant and equipment in which such reactions take place. Mechanical and electrical engineering and other branches of science come in on a secondary basis only. This branch of our industry utilizes well-trained chemists and physicists for research and control, and technical chemists with chemical engineering training for designing production.

This branch of the industry may consist of concerns producing the plastic materials only and selling them to other trades to work up into finished products, or in some cases producing the materials and working them into finished articles themselves, either directly or through subsidiaries. In number, this branch represents a small proportion of the whole industry, perhaps a little over a dozen or more. Most of them are represented by private companies, with the exception of three, and it is estimated that they represent a total invested capital of about £2,000,000.

The fabrication of plastics was very thoroughly dealt with by Mr. Potter, who stated that this group is by far the largest in number, employees, and also value of goods produced. As it uses the plastic material from the last group as a raw material, and has to put added labour, expenditure and technique into the product, it is bound to have a higher turnover. According to Board of Trade figures it amounted in 1935 to £7,600,000 sterling, and it is estimated that the figures for 1937 should total £10,000,000.

The official figures for plastic material manufacture plus those issued for casein, celluloid, cellulose acetate and other cellulosic plastics, give a total of £2,000,000 for the year 1935. In Mr. Potter's opinion this will be exceeded for 1937 by half a million pounds.

The consumer fabricators, who mould resinoid moulding powders, work up celluloid or casein, fabricate laminated material entirely for their own consumption in other finished products which they market, were next studied by the speaker. He regretted that it was quite impossible to obtain any published statistics on this side of the industry as they are not published separately, and the plastic products they produce would be used as part of an assembly and would be included in the turnover of that industry.

A statistical survey of the plastic industry reveals some interesting and somewhat astonishing facts. First of all, the true plastics industry—that is, excluding all subsidiary suppliers—is represented by an invested capital of £5,000,000. This is made up of publicly subscribed capital of £1,500,000 and a balance of privately subscribed capital amounting to £3,500,000.

Based on Board of Trade returns, Mr. Potter estimated that in 1937 the total turnover would be from £8,500,000 to £10,000,000, and the number of persons employed about 25,000.

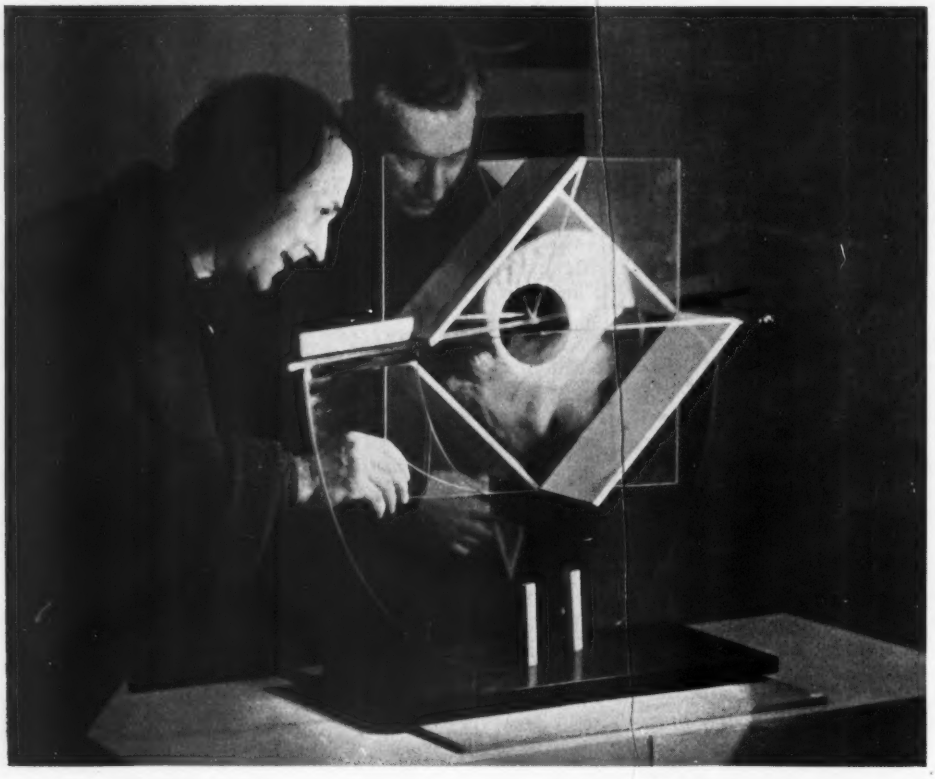
The position of the plastics industry to-day is comparable to the position of the chemical industry about 75 to 100 years ago, when that industry in this country mainly consisted of the production of the heavy chemicals. The earlier plastics of the celluloid and casein type can be likened to the heavy chemical industry, whilst the new synthetic resinoids can be likened to the discovery of synthetic colours.

As regards the "efficiency in man-power production" compared with other industries, Mr. Potter divided the turnover by the number of persons employed and obtained the following figures:—

Plastics	= £300 output value per person per year.
General Chemicals	= £900 output value per person per year.
Furniture Industry	= £360 output value per person per year.
Timber Trade	= £500 output value per person per year.

From the above it would seem as if the output per person is low compared with the four other trades selected. This must mean that the industry does not employ machinery to aid and improve the output of the employee to the extent that other industries do. Mr. Potter said that he had tried to analyse the meaning of this, and believed that it was due to the present set-up in the moulding and finishing industries—that is, the fabricating end of plastics. He considered that plastic material manufacture, whether it be celluloid, erinoid or resinoids, is about the same. The output per person was estimated to be nearly £850; that is, efficiency output 850 compared with 300 for the total industry.

The only answer to this considerable difference in efficiency output is that more time, more money and a good deal more enterprise will have to be put into the fabricating end of this side of the industry. Mr. Potter stressed the fact that this would result in increased prosperity in the industry.



Mr. Naum Gabo explaining an exhibit to the Editor of "Plastics."

CONSTRUCTIONS IN SPACE

Naum Gabo's Work in Plastics

LAST month we visited the London Gallery to view some remarkable examples of the work of Naum Gabo, the Russian artist, which he terms "Constructions in Space." We shall make no attempt ourselves to analyse their meaning, since we make no pretence of being artists, but we admit that the absence of mass did give us a very pleasurable sensation. To us, perhaps, part of the delight was due to the brilliant technique involved, as any worker in cellulose acetate will admit, and also to the faint resemblance between this and the work of chemists in constructing models of molecules and of what are known as stereo-chemical subjects. And also because the objects were made from casein, cellulose acetate and acrylic resins.

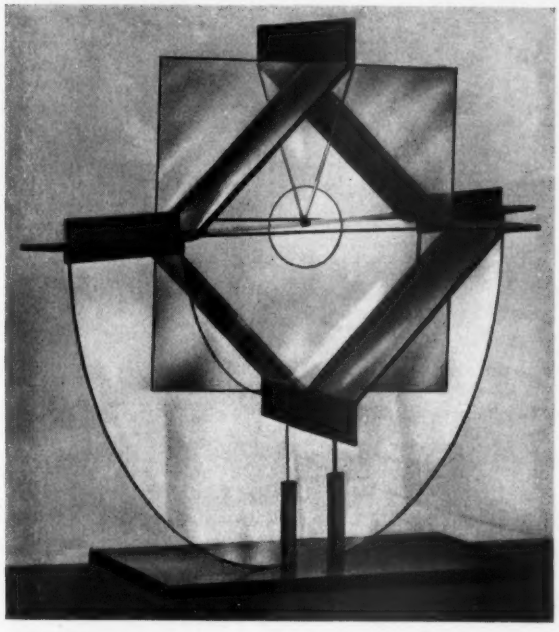
It will be more valuable to quote Jan Gordon, the art critic of *The Observer*:—

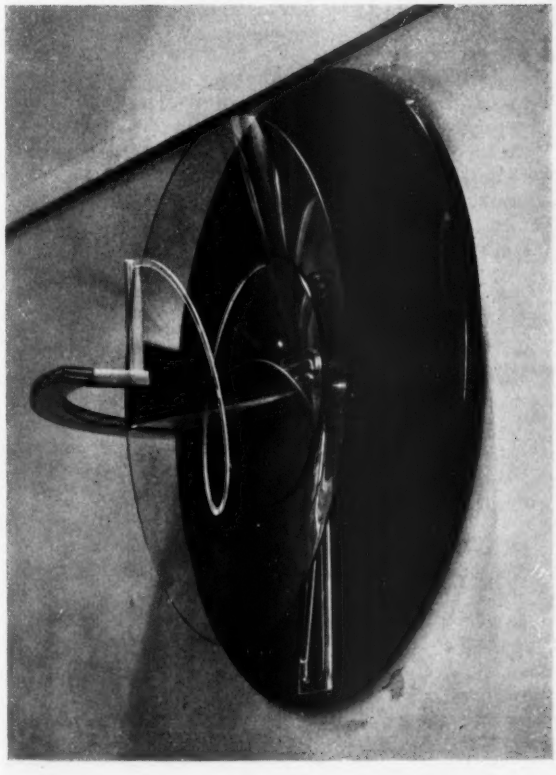
". . . Nevertheless, at the London Gallery one piece is so remarkable for a certain quality that one may recommend it as a very good introduction to those who are interested in, but have found it difficult to appreciate, works of an abstract or constructive nature. This piece is a work in transparent acetate sheets by the Russian artist Naum Gabo. Formerly Gabo's constructions have been to me mathematically interesting, but little more. In this one he seems to have combined brilliantly a sense of solidity, and designed surfaces with curved and straight linear movements expressed in a three-dimensional transparence, and I am convinced that anybody with a true sense of three-dimensional form must be delighted by its subtle complexities and its ever-changing rhythms. . . ."

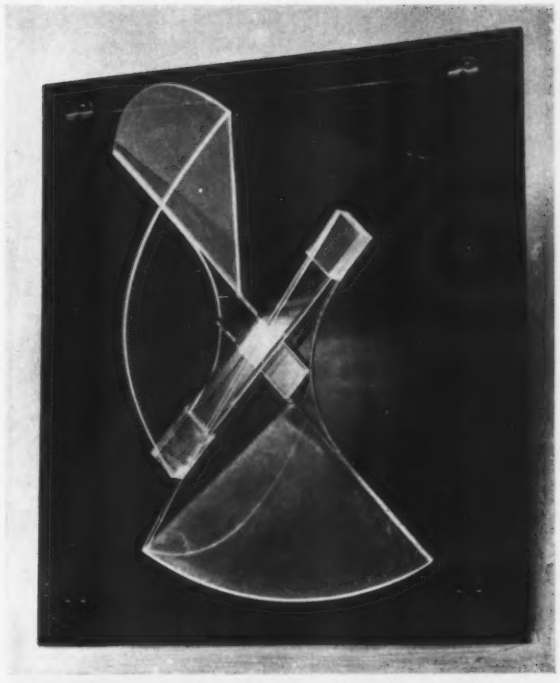
In addition, the following notes have been sent to

us by the organizers of the London Gallery Exhibition:

"These sculptures are made in combinations of plastic materials by Naum Gabo, who has been a pioneer in the use of new synthetic substances since about 1914, when he first started to make his 'Constructions in Space.' They illustrate the infinite possibilities of plastics when skilfully handled, and show the way that plastic materials have become not only part of everyday life, but have also great artistic possibilities. At the same time they represent a preparatory study for the new designs for plastics, showing where lies the







æsthetical value of an object apart from its functional necessity. According to Gabo's theory, which is known as 'The Constructive Idea,' he does not mean his work to be simply patterns for industrial design; on the contrary, he emphasizes that an industrial design for any material must first of all be functional. Gabo's earlier work influenced the style of Modern Architecture, which was at that time just beginning. His most recent work illustrates the direction in which modern art is now moving, and affords a glimpse of the style which is evolving in all forms of Art to suit modern life."

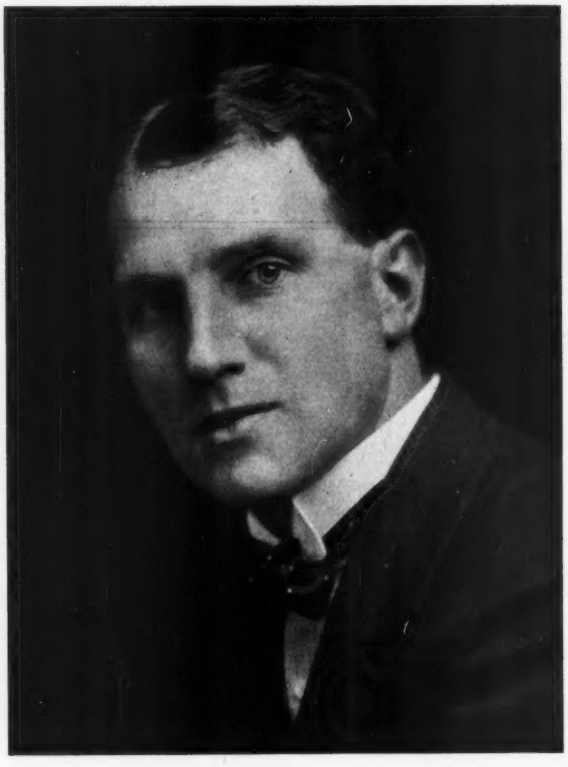
DRY CLEANERS WOULD WELCOME PLASTICS

by J. Bernard Argent

Managing Director, Achille Serre Ltd.

IN modern business, it doesn't really matter what business, the successful executive must not only be master of his own particular subject, but fully alive to the advances made in other industries. It quite frequently happens that the problems of one trade can be solved, almost unwittingly, by other and apparently totally dissimilar trades.

For some years now I have watched with very considerable interest the growth and development of the plastics industry. My attitude as a sympathetic and impartial spectator has, I think, enabled me to appreciate those early struggles and to admire the tenacity of purpose and initiative of the pioneer firms, to whom great credit is due.



Mr. J. Bernard Argent is one of the best-known figures in the dry-cleaning industry.

A Bakelite top for this table would prevent gloves from getting stained and dirty.

The products of the plastics industry are now widely recognized as something far more than mere substitutes for wood, metal, ceramics, etc., and their applications are extending and becoming more important every day. There are, of course, still many industries where plastics are comparatively unknown, and it must be confessed the name often conveys very little to the men in control. This is particularly unfortunate, but will, I hope, be remedied as knowledge spreads and the plastics industry expands.

The dry-cleaning industry, although generally considered progressive, has so far ignored these new synthetic materials, or shall we say that the plastics industry has not yet considered how it can help dry cleaners? Possibly both versions apply equally well, and, to my mind, this is rather a pity, as I can call to mind a number of important applications for plastics in the modern dry-cleaning plant, such as we have at Blackhorse Lane, Walthamstow.

Let us consider some of these. In all dry-cleaning plants use is made of inspection tables, where the cleaned garments, gloves and hats, etc., are examined and checked. At present these tables are plain wooden ones covered with brown paper, linoleum or, in some cases, just varnished. None of these surfaces is really satisfactory, and some goods, especially white flannel trousers, silks and other delicate fabrics, are inclined to pick up dust and get dirty very readily. I should think that a laminated-plastic table top would supply

a really efficient answer to this problem and one that might well be accepted, provided the price is not exorbitant, by cleaners throughout the country.

Apart from inspection tables in various departments, there are the spotting tables. These are covered with heavy plate glass, which is expensive and, unfortunately, brittle and liable to chip rather easily. Where the glass gets damaged there is always a chance of the operator cutting his or her hands, and also tearing the goods. Here, again, laminated material might well fit the bill, as it is strong, well able to withstand plenty of hard wear and yet unaffected by the usual spotting agents used by the cleaner in his everyday work.

Surely something might be done to improve the horses used for stacking processed or finished goods! These are made of ordinary soft wood, and once they get really dirty cannot be thoroughly cleaned, as the dirt sinks right down into the pores. I should have thought that impregnated wood, which I have read about in *Plastics*, might be very suitable for this purpose, but as I'm not an expert I must leave the question open for others to answer. Possibly these horses might be constructed of extruded rods.

Turning briefly to the actual working equipment, I consider that the winches used for dyeing lengths of silk, which are at present made of wood, might very well be made of non-absorbent and easily cleaned synthetic resin. The disadvantages of wood are obvious. The wood absorbs the dye very readily and is, therefore, impossible to keep clean; then, again, it splinters easily and is always a potential source of damage to the silk, which during dyeing is tender and the fibres liable to tear. The paddle blades used for propelling garments in the dyeing vats are also worthy of consideration. Wood is used, but is really unsatisfactory; plastics ought to be able to do the job a good deal better.

Whereas in silk dyeing the temperature is fairly low, for ordinary garment dyeing the plastic paddle blades would have to be able to withstand constant dipping, but not prolonged immersion, in liquor at 100 degrees. Centigrade.

Once the plastics industry supplied material able to stand up to these conditions, which, in my opinion, are not particularly severe, a great and profitable field would be open for exploitation. Here's another opening for synthetic material. I have read a good deal about electric fans made of Micarta, which are, of course, non-corrodible and especially suitable for moist and contaminated atmospheres. In all dyehouses metal fans are used, and these are attacked by acid fumes and eventually become eaten away. Obviously an opportunity exists for plastics, and it is high time someone from the industry canvassed the dry-cleaning trade, if only for their opinion. It is no use for plastic manufacturers to rush into this undeveloped market without studying its particular difficulties; these must be given the closest consideration.

The problem of ventilation, although a serious one even in large factories like that of Achille Serre's, is still more serious in those hundreds of small, one-room shops using non-inflammable chlorinated solvents. I should imagine that a large percentage of these would welcome a small, efficient air-conditioning unit, such as the latest moulded one by Fractional H.P. Motors, Ltd., which, I understand, has just been marketed.

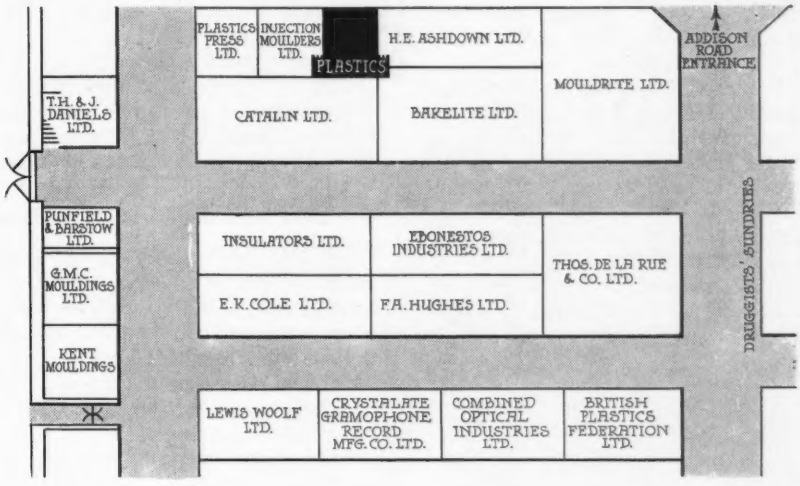
Plastics obviously more suitable than wood for this unloading box over a washing machine.

Large "horses" used for glazed chintz.

Replacing hat bands on cleaned hats. Note the table which is covered with paper.

Plastics at the British Industries Fair, 1938

THE PLASTICS SECTION



The following notes give short historical accounts of the stand holders in the Plastics Section at Olympia. Their positions are seen in the above map. Included at the end are similar notes relating to those plastic manufacturers who are exhibiting at Castle Bromwich, where there is no special plastics section. Lastly, we mention our own stand, which we believe visitors will consider of outstanding interest. Inquiries for this journal and problems regarding the plastics industry will be welcomed at Stand No. A.676.

The British Plastics Federation, Ltd. Olympia Stand No. A.711

Since this body is the trade organization of the plastics industry, for which it has carried out so much valuable propaganda, including the creation of the Plastics Section at the B.I.F., we have pleasure in giving at the beginning of this special section some indication of its manifold activities.

It was originally known as the British Plastic Moulding Trade Association, which was established in 1930 with the object of co-ordinating under one central organization those British manufacturers wholly interested in the plastics industry.

An opening meeting of the Trade was held on May 26, 1930, at the Connaught Rooms, London, W.C.2, and was immediately followed by the first general meeting of the new Association. A council and various officers were elected, and it was unanimously agreed that membership of the Association should not be restricted to moulders, but should embrace all phases of the industry. The late Mr. Bernard Weaver, at that time connected with Ebonestos Industries, Ltd., was appointed as the first chairman of the Association and Captain C. W. Barber was elected to the vice-chairmanship.

The Association immediately tackled with zeal the numerous problems confronting the plastics industry at that time and every effort was made to encourage as many potential members as possible to join the Association with a view to establishing a spirit of good will and harmonious co-operation where keen and often unfair competition was prevalent. The Association was divided into a number of sections, each representing one branch of the industry, and meetings and discussions were arranged with a view towards the improvement and stabilization of conditions of trade within the industry. Every effort was also exerted to make the public more plastics-minded and to impress upon the Government the rapidly increasing size and importance of the trade. On February 16, 1932, a special luncheon was held at the Savoy Hotel, London, to inaugurate a Plastics Section at the British Industries Fair, Olympia, and in 1933 the first Plastics Exhibition in this country was staged at the Science Museum, South Kensington. At a trade luncheon held on March 23, 1933, the Association was honoured in having the present Duke of Kent, then Prince George, as its principal guest.

The enormous growth, however, in the applications of the products of the industry to larger and wider spheres necessitated the needs of these wider interests being taken into consideration; and in 1933 the Council of the Association decided to organize a body under the title of the British Plastics Federation, Ltd., which would take the place of the Association. On December 21, 1933, registration was successfully applied for, and the present Federation was subsequently established. The principal objects of this organization may be briefly defined as follows:—To promote co-operation between British firms and corporations engaged in the various departments of the plastics and allied industries; to provide opportunities for members to exchange views on the problems connected with the plastics industry in its widest interpretation, and by discussion and friendly debate to find solutions to such problems; to promote co-ordination among the various departments of the plastics industry, and to assist co-operation in the manufacture of plastics products, from the supplier of the raw materials to the ultimate consumer; and to keep in touch with the Government through the Board of Trade and other Government Departments regarding all matters affecting the plastics industry.

The Federation adopted the constitution of the former Association, although on a wider scale, and is divided into a number of sections, each of which is actually a minor association within the parent body. Meetings are held at regular intervals of the Moulding Powder Manufacturers, Moulders, Mould and Tool Makers, Plant Makers, Synthetic Resin and Varnish Manufacturers.

The Federation has carried on the work of the Association with regard to the annual British Industries Fair, and each year is allotted about 7,000 sq. ft. of space at Olympia for the formation of a Plastics Section. The interests of our exhibitors are taken care of through a representative of the Federation on the B.I.F. Exhibitors' Advisory Committee; and it is satisfactory to record that the Plastics Section at the British Industries Fair this year will occupy a larger and a much-improved position on the Ground Floor at Olympia (Grand Hall), and, furthermore, will be of uniform design and

Mr. G. T. Beach, Secretary, British Plastics Federation, Ltd.

appearance. While dealing with exhibitions, mention should be made of the Federation's activities on former occasions in connection with the Plastics Exhibits at Messrs. Lewis's Store, Manchester, at the Brussels Exhibition, and in the British Pavilion at the recent Paris Exhibition. A special Federation stand will also be seen in the Palace of Engineering at the forthcoming Empire Exhibition at Glasgow.

The Federation maintains close contact with the various Government Departments, and representations have frequently been made to the Department of Overseas Trade, the Board of Trade, the General Post Office and the Import Duties Advisory Committee for the improvement generally of trading conditions within the industry. Opposition was registered to a proposed increase in the import duty on woodflour, an application was supported for a higher duty on imported radio accessories, and the Federation was successful in obtaining a redraft of the Post Office Packaging Regulations to include plastics. Negotiations with the Board of Inland Revenue were recently brought to a successful conclusion whereby a special wear-and-tear rate for plant and machinery used in the moulding side of the industry comes into immediate operation.

Through its Technical Committee, the Federation collaborates with the British Standards Institution, the Electrical Research Association, the B.E.A.M.A. and similar bodies in the preparation and/or revision of standard technical specifications.

The Federation has already become a bureau of information for users, and potential users, of plastics, and the services of its Inquiry Department are at the disposal of members and non-members alike.

Kent Mouldings. Olympia Stand No. A.701

On this stand in the Plastics Section of the British Industries Fair at Olympia, Kent Mouldings will exhibit an interesting selection of plastic mouldings in a variety of materials and many attractive colours.

Kent Mouldings have long and comprehensive experience of the design, production and practical applications of plastic mouldings for industrial, electrical, medical and domestic purposes.

Particularly interesting examples of mouldings used in aircraft, telephone, telegraph and radio apparatus, electrical appliances and in the textile industry will be shown.

In addition, specimens of high-grade mouldings for fancy goods, toilet requisites, modern packs, containers and closures, advertising and display novelties, toys, etc., will be on view.

Kent Mouldings will have experts in attendance at the stand to advise visitors on any subject associated with the design, manufacture and uses of moulded products.

Punfield and Barstow, Ltd. Olympia Stand No. A.699

Although what might be called general moulders, which includes the moulding of thermo-hardening resins, this concern has made a speciality of injection mouldings made from cellulose acetate. In consequence the main display at this stand will be of mouldings made by this process. Included will be examples of their patented "No-So" buttons, which replace advantageously the old bachelor's button, and eliminate many difficulties of the ordinary ladies' type.

In addition, there will be shown a new standard lamp, to which reference is made on another page.

Thomas de la Rue and Co., Ltd. Olympia Stand No. A.807

This is one of the foremost of those moulding concerns in the country that carries out in practice what this journal preaches in print, namely, the gospel of quality goods.

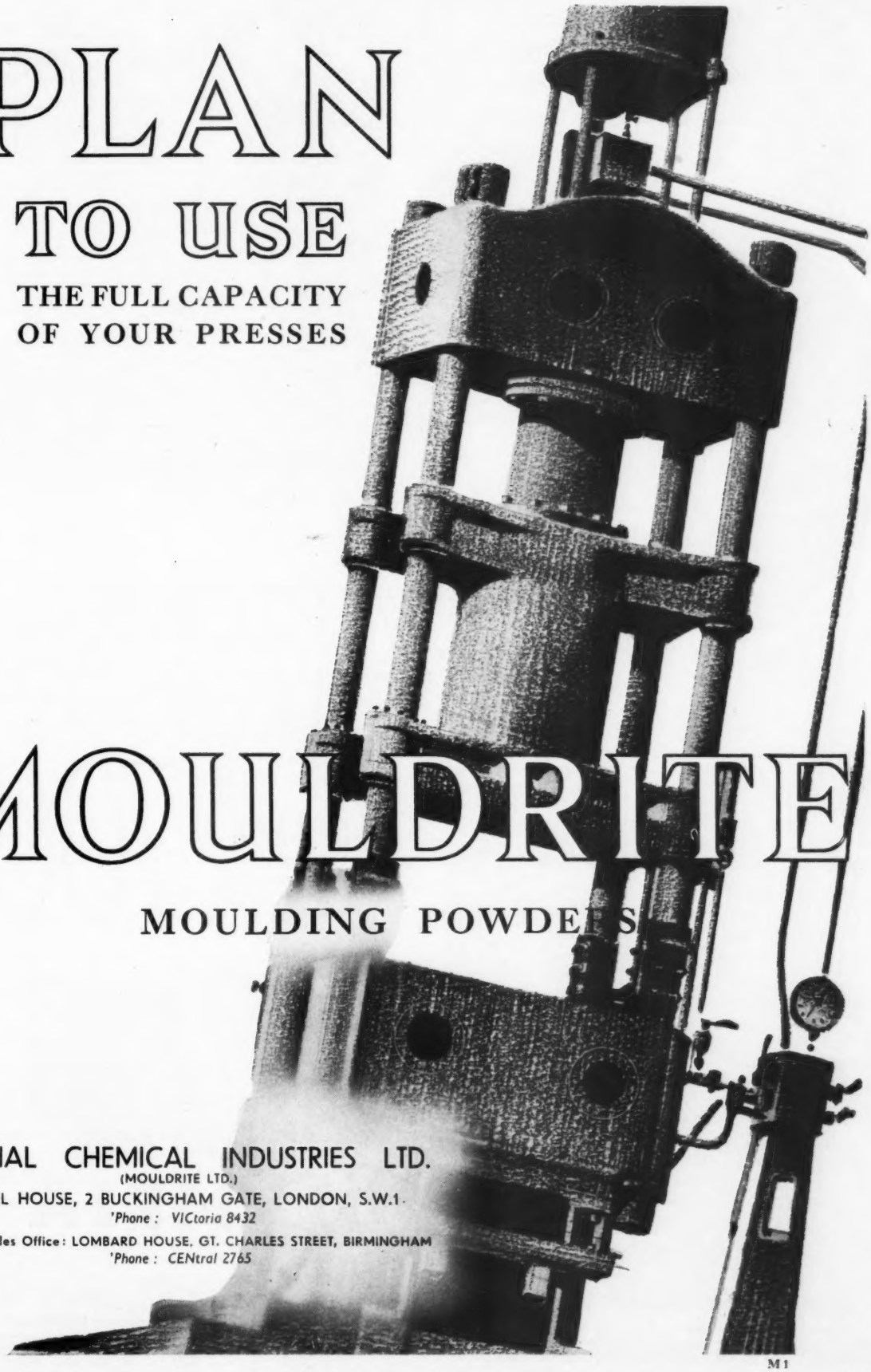
We have received an interesting letter from Mr. Middleditch, of the Design and Publicity Department, regarding their activities and their stand at the B.I.F., which we reproduce herewith:—

"Our display at the British Industries Fair will consist of our most recent productions, including mouldings in thermo-setting and thermo-plastic materials for the following industries: Aircraft, Electrical (General), Engineering (General), Motorcar, Radio, Railways.

"We are also displaying a number of actual moulds produced in our own tool shop and hope that these will be of particular interest to the general public.

PLAN TO USE

THE FULL CAPACITY
OF YOUR PRESSES



MOULDRITE

MOULDING POWDERS

IMPERIAL CHEMICAL INDUSTRIES LTD.
(MOULDRITE LTD.)
NOBEL HOUSE, 2 BUCKINGHAM GATE, LONDON, S.W.1
'Phone : VICtoria 8432
Midland Sales Office: LOMBARD HOUSE, GT. CHARLES STREET, BIRMINGHAM
'Phone : CENtral 2765

M1

WELCOME VISITORS TO

Stand A 700

BIF

OLYMPIA

We shall be very pleased indeed to have you visit our stand at the B.I.F. and be allowed the opportunity of showing you examples of our workmanship. A large variety of mouldings will be displayed, applicable to many trades, and application of these mouldings will also be demonstrated. We should like to remind you that in case you are unable to come along and see us we shall be pleased to send our representative to you to discuss any moulding which you might have under contemplation. We shall always be glad of a chance to assist you.

G.M.C. MOULDINGS LTD., 240/2, York Road, LONDON, N.7

Works: Clarendon Road, Hornsey. Telephone: North 2292 (3 lines)

Major H. C. Parker, A.M.I.E.E., Director of Thomas de la Rue and Co., Ltd. He is also Vice-Chairman of the British Plastics Federation, Ltd.

" Our object is to demonstrate that plastics play a definite and important part in modern industry and have long outgrown the ' novelty ' stage.

" As you know, we have specialized very largely in the production of large-sized mouldings, and the extension of our factory at Walthamstow Avenue includes new equipment which will enable us to extend this policy still further. The contrast between these new shops and our original wartime works is marked.

" During the war we had comparatively few presses producing shell-blanks in bituminous material. After the Armistice, Major Parker took over control of the factory and developed our ' Telenduron ' line insulators and weatherproof terminal blocks from an improvement of this same bituminous material.

" The efficiency of Telenduron has been proved by the G.P.O. and by other organizations throughout the world, and it continues to have a large sale.

" We then began general moulding and developed the application of the phenol resins, the urea resins and the thermo-plastics as they became available. Among our more spectacular achievements is the production of beakers for the ' Odol ' Gift Scheme, which exceeded a total of 2,000,000 articles, the production of a moulded table top 2 ft. in diameter as long ago as 1934, the development of the G.P.O. handset telephone in colours, the production of the first moulded hair drier and, more recently, the development of mass-produced large-sized radio cabinets."

Injection Moulders, Ltd. Olympia Stand No. A.679

The process carried out by this firm and others who use the comparatively new injection process, in many ways revolutionized the plastic industry. It utilizes the thermo-plastic materials, such as cellulose acetate, and enables an extremely rapid output of articles of sizes and shapes which cannot easily be produced by the ordinary moulding press. In effect, the method consists in squirting the soft plastic into a mould, which then opens and automatically ejects the finished moulding. As the mould is usually a multiple one, one injection produces several finished shapes.

Injection Moulders, Ltd., are showing a vast variety of such goods—thimbles, teething rings, tooth-paste closures, collar studs, fountain-pen components, ladies' buckles and buttons, and furniture handles. All these will be shown in a variety of colours.

Combined Optical Industries, Ltd. Olympia Stand No. A.712

Some very interesting examples of lenses moulded from transparent plastic materials and enlargements of photographs taken with them will be on exhibition. This new venture is so fascinating that we take pleasure in publishing the following details concerning it.

From the time that the manufacture of lenses first began (probably in the 13th century) there has been no change in principle, either in the methods or in the materials used. That is to say, hitherto lenses and other optical bodies have always been produced from various types of glass by grinding and polishing, the latter processes being carried out by hand when the highest accuracy is desired. It is true that, for certain special purposes, other materials, such as quartz, may be used; but, broadly speaking, materials and methods have remained unchanged from earliest days.

When, therefore, a claim is now advanced of the ability to manufacture lenses of the very highest quality from plastics, or synthetic resins, by means of a moulding process, it is evident that, if substantiated, this claim will represent a revolution in the optical industry. Such substantiation is the *raison d'etre* of Combined Optical Industries, Ltd., a company which, formed some 18 months ago, has established its research laboratory in London, and has recently erected a factory at Slough. Although, as with every new industry, much pioneer work has still to be done, and, as with the healthiest of infants, teething troubles are to be

P. Koch de Gooreynd, Chairman of Combined Optical Industries, Ltd.

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expected, yet sufficient has already been accomplished to leave no reasonable doubt that, ultimately, optical systems of any complexity will be producible by moulding the components from plastics.

Up till now the company's products have been limited to a few simple lines, such as view-finders, opera-glass oculars and objectives, and small aperture camera lenses. It is just these simple meniscus camera objectives that indicate (through the photographs taken with them) the possibilities of the new process. An inspection of the enlarged prints on view reveals a most unusual clarity and freedom from all kinds of aberrations, such as are commonly associated with much more expensive types of lens. The reason for this superiority of performance lies in the aspheric surfaces which can be obtained on a moulded lens at much less cost than on a glass lens. In the case of glass, each such lens has to be ground and polished by hand; once the die for the plastic lens has been prepared, all the lenses moulded by it leave the die with the highest optical finish and exactly true to pattern.

In view of the inferior hardness of plastics as a whole, in comparison with glass, the liability to damage by scratching has appeared an obvious drawback to the use of plastic lenses. This objection, however, no longer holds good, for not only are considerably harder materials being developed, but it has been found possible to produce a superficial hardness quite adequate for all practical purposes. When, therefore, the great advantages of toughness, lightness of weight, and transparency (especially to ultra-violet radiation) are taken into account, it will be realized what a large field is open for exploitation by this new venture in British industry.

Bakelite, Ltd. Olympia Stand No. A.684, Earls Court 560, and Castle Bromwich Cb408

Sir James Swinburne, Bart., F.R.S., chairman of Bakelite, Ltd., was one of the earliest workers on phenol-formaldehyde condensation products in this country. Sir James, then Mr. Swinburne, started his investigations on these products as far back as 1906, after purchasing the British rights of the Luft Patent of 1902. The early work was carried out in Mr. Swinburne's own laboratories, attached to his offices at 82, Victoria Street, London, S.W., where he had a staff of investigators working.

The first outcome of this work was the formation of the Fireproof Celluloid Syndicate, whose brief endeavour was to produce non-inflammable transparent products, including films.

Some transparent phenol-formaldehyde products were actually manufactured and sold, including battery boxes and gramophone records, but it must be admitted that these were unsatisfactory owing to the development of flaws and high cost.

Experiments were then carried out on the production of liquid products, particularly varnishes and lacquers made from this class of product.

The formation of the Damard Lacquer Co. took place in 1910 to take over the Fireproof Celluloid Syndicate, and operations on a semi-commercial scale were started in the City of Westminster, London, during that year.

The Damard lacquers developed commercially owing to their resistance to scratching, moisture and chemical fumes, and the business grew to such an extent that larger premises were required.

The brass industry was established in Birmingham, and most of the lacquer trade was, therefore, centred there. A small building was taken at 98, Bradford Street, Birmingham, where manufacturing operations were carried out on a larger scale. Manufacture continued in these premises until 1920.

During the war another factory was acquired at Cowley, Uxbridge, where the manufacture of moulding materials and resins for laminated production started as an outcome of further development and experimental work.

The output of both Cowley and the Birmingham works was pressed to the utmost during the war to supply the requirements for war purposes, mostly in the direction of varnishes for laminated materials. At the same time, considerable quantities of moulding powder were also made.

At the end of the war concentration at one works in Birmingham was decided upon and a works was erected

Mr. H. V. Potter, B.Sc., F.I.C., Managing Director of Bakelite, Ltd., Chairman of British Plastics Federation, Ltd.

at Greet, and transfer of the other two smaller works was effected during 1920-1.

In 1927 an amalgamation was effected between the Damard Lacquer Co., Ltd., Mouldensite, Ltd., and Redmanol, Ltd., all of which were carrying on business in England. This resulted in the formation of the present company, and Mr. H. V. Potter, who had been manager of the Damard Lacquer Co. since 1914, was appointed managing director.

At that time the Damard Lacquer Co., Ltd., were operating under licence with the Baekeland Patents, Mouldensite under licence of Condensite Patents, and Redmanol, Ltd., were marketing the products of the Redmanol Chemical Products Co. in this country. As a result of this amalgamation and the desirability of concentrating the manufacture at one factory, a site was acquired at Tyseley, Birmingham, and a new works built.

The Tyseley works have been growing continuously and now cover an area of nearly 30 acres, and include extensive research and development laboratories. The equipment is of the most up-to-date type, much of it

having been developed in the works engineering department and dictated by the experience gained since 1910.

It is only natural that the range of products manufactured by the company should have extended, and it now includes Bakelite moulding material, Bakelite laminated sheet for industrial purposes, Bakelite decorative sheet for furniture, wall panelling, etc., paint and varnish resins, varnishes, lacquers, cements and denture material.

At Olympia and at Earls Court there will be a representative range of these materials. At Birmingham the entire stand will be of laminated material.

T. H. and J. Daniels, Ltd. Olympia Stand No. A.682, and Castle Bromwich Cb125

This famous Stroud concern we have known for many years, more especially as suppliers of presses and pumps to the chemical industry, and to the original branches of the plastics industry—casein and bitumen moulding production. When modern plastic production began, it found this company well prepared to deal with all problems involving hydraulic presses and its complementary machinery. Incidentally, it has been in existence nearly 100 years.

There will be two exhibits, one at Birmingham and the other at Olympia. The first will consist of a 50-75-

Mr. John Stuart Daniels, Chairman of T. H. and J. Daniels, Ltd.

ton semi-automatic moulding press with a self-contained pump unit and electrically heated platens. In addition, there will be a 500-ton hobbing press, one of those remarkable machines which make steel moulds in minutes instead of days.

At Olympia a 50-75-ton press similar to that at Castle Bromwich will be on view and also a Size 3 preforming machine for making 3-in. pellets from moulding powders.

We were extremely pleased to hear that business has necessitated extensions to the works and to the offices of the Lightpill Iron Works.

Catalin, Ltd. Olympia Stand No. A.683

By the time the B.I.F. opens at the end of February a new factory in Essex, covering 4½ acres and said to be the most modern plant of its kind in England, will be in full commercial production.

This plant has been designed and installed at a cost of many thousands of pounds to manufacture a material known as Catalin, a synthetic resin which is relatively new in England and promises to have a far-reaching effect on the plastics industry.

Previously material of this type was imported from the Continent, and especially from the United States, where 5,000,000 lb. is produced annually. Although one of the earliest developments in the plastics field, Catalin within the past five years has shown real commercial properties and has developed into a million pound industry.

The factory at Essex is designed for the production of 100,000 lb. of material per month, but can readily be extended to larger proportions, and should have a very stimulating effect on employment in the locality.

Catalin is a cast synthetic resin, which, unlike the well-known pressed and moulded materials, does not require any special machinery to be converted into the finished product. It therefore has great educational value and can be used by manual training centres, technical schools and home craftsmen. It is a pilot material leading the way to an understanding of the enormous new possibilities in the plastics world.

Catalin is supplied in solid form, such as rods, tubes, sheets or special castings, and is used for every purpose from airplane parts to door knobs or fancy jewellery.

The material is not only easy to use but has properties which make it very desirable for industrial purposes. It is non-inflammable, tasteless, odourless, non-porous and resists all common acids.

One of the most attractive characteristics of the material is the amazing range of colours in which it can be fabricated. It can be fashioned to resemble perfectly the beautiful green of jade and the brilliant glowing colours of rubies, emeralds, sapphires and every semi-precious stone. It ranges from crystal clear to jet black, and can be opaque, translucent or transparent.

The Catalin exhibit at the British Industries Fair (Plastics Section, Olympia) has been designed to demonstrate to possible consumers the versatility and beauty of the material. There will be displayed not only hundreds of stock castings but also a collection of beautiful articles made from Catalin.

The fashion world will be represented by a display of buttons, buckles and costume jewellery from famous designers. For the household there will be unusual door handles, lighting fixtures and domestic equipment. And cosmetic firms, home craftsmen, interior decorators, motorcar designers and manufacturers in every sphere will also find much to interest them.

A particularly striking feature of the display will be the great pillars built from hundreds of rods of ruby crystal Catalin, through which light will be diffused.

The importance and rapid expansion of cast synthetic resins is demonstrated by the fact that in 1936 production totalled 8,000,000 lb., of which Catalin in the United States alone is responsible for over 5,000,000 lb.

If British firms are as quick as their American competitors to see the possibilities that plastics generally, and cast resins in particular, hold out to them, there should be an enormous future for Catalin in this country.

Mr. J. R. Gammell, of Mouldrite, Ltd.

Mouldrite, Ltd. Olympia Stand Nos. A.676/685

Mouldrite, Ltd. (Imperial Chemical Industries, Ltd.), are manufacturers of modern plastics, including phenol-formaldehyde, urea formaldehyde and acrylic moulding powders and resins. Raw materials used for these products will be shown on their stand, and articles made from them displayed on counters constructed from laminated plastics. The central feature of the stand will be a display of the new G.P.O. coloured telephones made from "Diakon."

These instruments will be arranged at the base of a "Perspex" sphere, 39 ins. in diameter, designed to show the shaping properties of this highly transparent plastic. The precision with which "Perspex" can be worked is shown by exhibits of draughtsmen's instruments, and also by articles turned or carved from cast sheets of the material by the late Lady Gertrude Crawford and Mr. A. L. Hetherington. Our readers will remember that we published some remarkable photographs of the work of the late Lady Gertrude Crawford in our September, 1937, issue.

"Perspex" has been adopted as the standard material used in aircraft for windscreens, cockpit coverings, cabin windows, gun turrets and other applications of transparent material. In the past year it has also been fitted to the observation car of the L.N.E.R. Coronation train, and used for a specially constructed windscreen on Captain Eyston's record-breaking car—to cite only two interesting special applications.

F. A. Hughes and Co., Ltd. Olympia Stand No. A.703

This company are essentially raw material manufacturers, and have been responsible for introducing into this country some of the latest type of synthetic resins, especially of those derived from vinyl chloride.

Their materials are used extensively for the production of all types of articles, and apart from the three main qualities of "Rockite" thermo-setting synthetic mouldings (each of which has its own sphere of application) a large range of powders for more highly specialized uses are available. Some of the articles made from these, such as radio-cabinets, meter cases, etc., will be displayed on the stand.

The following will also be on view: Part of the large range of "Rockite" impregnating and laminating resins made for high-grade insulation, and examples of what are made with them, namely, laminated sheets, insulating bushes and impregnated wood used for a variety of purposes, such as aeroplane parts, panels, etc.

There will also be on show a number of extruded tubes and sections made from "Rockite" by the Rockhard patented process, suitable for a number of purposes, such as handrails, beadings, etc. Large diameter tubes can be produced by this process, and a tube approximately 4½-in. diameter will be on view. This size is produced by Gestetner and Co. for the rollers of their duplicating machine. One of these machines showing this application will be on their stand, together with two completely assembled cylinders. Readers will remember that in our June, 1937, issue we described the process of producing these tubes as a result of a visit to Gestetner, Ltd.

Another extremely interesting department on this stand is that devoted to injection mouldings manufactured from "Cellomold"—the well-known cellulose acetate thermoplastic compound.

Finally, there will be seen here examples of Mipolam, the comparatively new thermoplastic resin of the polyvinyl chloride type (derived from acetylene as a raw material), and a display of cables and wires insulated and sheathed with this material.

G.M.C. Mouldings, Ltd. Olympia Stand No. A.700

G.M.C. Mouldings, Ltd., one of the most versatile of the plastics moulding fabricators, is of very recent growth, but is an amalgamation of two older concerns—General Mouldings Co., Ltd., and Latham Productions.

In the past few years the variety of goods turned

Mr. E. Wood, Director of G.M.C. Mouldings, Ltd.

out, apart from the quantity, is extremely interesting, ranging from bomb-dropping gear for the R.A.F. to refrigerator lids, razor boxes, vacuum cleaner units, motorcar parts, display stands, manicure sets, pencil boxes, thermostatic controls, and so on almost without end.

The work is carried out in phenolic or urea type of resins, but very recently the company has been examining the possibility of utilizing the new transparent Beetle resin to which we have often referred.

In an interview with Mr. Wood, one of the directors of G.M.C. Mouldings, Ltd., and who has over 12 years' experience in "mouldings," we gleaned the important information that since plastics and metals are so closely allied in many moulded products, the firm carries out its own metal pressing; thus certain jobs may be carried out completely under the control of the company.

The stand at Olympia will consist of entirely finished goods even when the plastic moulding is only a small part of the whole. This is an excellent idea, much better than showing what may often be to the public an unrecognizable unit.

E. K. Cole, Ltd. Olympia Stand No. A.702

E. K. Cole, Ltd., are exhibiting for the first time since they began to accept outside work on a large scale, and their stand has been designed to reveal the full strength of their resources. Large photo-murals show an aerial view of their 300,000-sq. ft. factory and illustrate the 1,700-ton presses, capable of producing such mouldings as table-tops, radio cabinets and heater casings.

The exhibits are varied and are designed more to show the capabilities of the plant than to market articles already in production. Most of the mouldings shown are specimens from current contracts. There are large-scale mouldings up to 12 lb. in weight; one-piece framings of intricate shape and section; mouldings from split and threaded dies to .001-in. accuracy; precision tapping and insert work, and examples of accuracy in alignment of fixing-bosses and mountings over a large moulding area.

Mr. W. S. Verrells, Chairman and Managing Director, E. K. Cole, Ltd.

Industrial mouldings shown include pre-payment slot meters, junction boxes, sealing chambers, power plugs and sockets, fuse boxes, plug adaptors, tumbler switches, cut-outs and fuse-holders, H.F. suppressor tubes, transformer bobbins, knobs and switch-handles, and many others in wide use in the electrical industry.

An interesting exhibit is the Thermovent heater, an electrical product of E. K. Cole, Ltd., being shown for the first time. The Thermovent uses convection principles and embodies a patented vent-assembly system designed to keep the outer casing cool, and thus permit its production by the moulding process.

Apart from purely functional mouldings, there are many interesting examples of decorative possibilities. Typical specimens are mouldings in red, green, black, cream, blue and walnut, together with a wide choice of mottled effects, in addition to a number of articles in which chromium-plated bars and panels have been combined with the moulded sections. Interesting use of this versatility is shown in radio cabinets in which two or more different colours are used.

The Ekco Stand at Olympia is No. A.702 (Plastics Section), where advice and information on all aspects of plastic moulding are available. Mr. H. Vic Verrells, Mouldings Sales Manager of E. K. Cole, Ltd., is in constant attendance.

Insulators, Ltd. Olympia Stand No. A.698

The story of Insulators, Ltd., is one of progressive and enterprising development from a modest beginning. The company was originally formed about twelve years ago to manufacture hardwood fittings, such as switch-blocks, for the electrical industry. The advantages of Bakelite, with its excellent insulating properties, for this type of goods were quickly recognized and the company installed Bakelite moulding plant. It was not long before it was seen that there was great scope for the new plastic materials in other fields than electrical fittings. Under the able direction of the general manager, Mr. W. Charles Waghorne, whose experience and practical knowledge of the plastics industry are outstanding, a policy of consistent expansion was developed. It is worthy of note that the company has specialized throughout in plastic mouldings, not undertaking general trading or branching out as suppliers of such subsidiary articles as metal fittings.

The business grew rapidly and two changes of premises in quick succession were rendered necessary. In 1935 Insulators, Ltd., moved into the present model factory and offices at Angel Road, Edmonton, N.18. To-day, an extension to the building is in progress which will double its size. From the small initial figure of 20 tons, the total press capacity has grown to 5,000 tons, covering a range of presses from 10 tons to 1,200 tons, and with the latest injection-moulding machinery. Over the same period the company's employees have increased in number from ten to two hundred and fifty.

The company has consistently pursued a policy of quality—its slogan is "Mouldings of Merit"—and service, a policy which has materially assisted in making Insulators, Ltd., one of the leading plastics manufacturers in this country to-day.

The special features at this stand will include display stands, "Quicklo" fancy goods, hair-drier helmets, radio and electrical mouldings, etc.

Ebonestos Industries, Ltd. Olympia Stand No. A.697.

This is one of the very first of the plastic moulding firms, having been founded in 1900; it then produced a wide range of electrical and other goods, specializing in bitumen-mixture compositions. We believe the word Ebonestos was used almost universally to mean bitumen asbestos compositions. The late Mr. G. B. D. Weaver,

Sir Herbert Morgan, K.B.E., Chairman, Ebonestos Industries, Ltd.

for over 25 years a director of the company, was regarded as one of the pioneers of moulding insulation. To-day all types of mouldings are made at the works, although the company specializes in high-quality precision mouldings for the electrical industry.

H. E. Ashdown (Birmingham), Ltd. Olympia Stand No. A.677

With the closing of the year 1937 there concludes one which may prove to be momentous in the history of H. E. Ashdown (Birmingham), Ltd. In every phase of the production of plastics enormous expansion has been the keynote, and with the opening of the new factory at Eccleston, new plant has been installed.

One of the major policies of the company has been to expend efforts for the development and application of plastics in fields which have hitherto been unexplored in this respect, and in addition to utilize to the full the versatility of plastic mouldings in the search for further potential applications. In order to effect an all-round increase in production capacity it has been necessary to put down extensive plant at the Eccleston factory, comprising automatic injection machines capable of high-speed production, together with automatic compression plant by means of which mouldings may be produced at hitherto unheard-of speeds.

In addition to new plant for the production side of the industry, new research laboratories have been introduced and new methods evolved, with a consequential advance in materials, methods of production and all factors relative to an improved plastic moulding.

Upon the Ashdown Stand (No. A.677) there will be displayed all types of moulding work in thermoplastics and thermosetting materials. Certain mouldings are being exhibited which will illustrate the keen interest that is being shown in this new industry by the motorcar manufacturers at large. In addition, exhibition will be made of sundry types of electrical equipment and components, plastic fittings for the cold storage industry, and a comprehensive range showing modern designs of bathroom furniture.

An associate company, Messrs. Plastics Developments Sales, Ltd., will again be exhibiting at the Fair in the hardware section at Birmingham. Here on Stand No. A.230a hearth furniture, companion sets, smokers' stands, bedside table lamps, cake stands and occasional tables will be shown, all of which follow the trend of modern design.

Plastics Press, Ltd. Olympia Stand No. A.680

Our very amiable rivals, who produce *British Plastics*, the official journal of the British Plastics Federation. Plastics Press, Ltd., also produces a valuable year book of the plastics industry.

B.I.F., BIRMINGHAM

British Industrial Plastics, Ltd. Stands Nos. C (b) 605 and C (b) 504 at Castle Bromwich

This concern was formerly the British Cyanides Co., Ltd., producing a large number of chemicals for various industries. It was thus in a peculiarly favourable position, scientifically speaking, to attack the problem of manufacture of urea and urea resins, which latter, in view of their potentialities of producing mouldings in light colours, or translucent, and even transparent, created world-wide interest when they first appeared.

[*Photo by Speaight.*

Mr. Kenneth Chance, Chairman, British Industrial Plastics, Ltd.

British Industrial Plastics, Ltd., with its subsidiary companies, The Beetle Products Co., Ltd., and Streetly Manufacturing Co., Ltd., occupies a somewhat unique position in the plastics world, for not only are the raw materials (urea and powders) made, but it also possesses what must be one of the best-equipped works for making steel moulds and another for producing finished mouldings from powders.

At the Birmingham B.I.F. there will be seen at the these stands a wide range of steel moulds for the plastics trade. The Beetle Products Co., Ltd., will be showing Beetle and Scarab moulding powders, opaque and translucent in various colours, and also the most recent of this company's products, the completely transparent variety of Beetle. In addition there will be exhibited the latest lacquers made from urea resin.

The Streetly Manufacturing Co., Ltd., will have on view examples of mouldings made by them in Beetle, Bakelite, Scarab, and Beetle Transparent, against their customers' special requirements. These will include meter cases, electrical fittings, radio cabinets, knobs and escutcheons, funnels, handwheels, scale parts, bottle caps, cigarette boxes, and so on.

There will also be exhibited as standard lines a range of extruded tubing in Beetle and Scarab, and lampshades made from Beetle translucent sheet.

Evered and Co., Ltd. Castle Bromwich Stand No. Ca.608

The B.I.F. at Castle Bromwich does not include, as does Olympia, a special section devoted to plastics. Those concerns which are in the plastics industry exhibit in a variety of sections, generally in those which are very closely allied to their own products.

Evered and Co., Ltd., are exhibiting in the Gas Section, for many of the products made are in use on gas appliances.

It was, indeed, with the production of oven-door knobs that this company began plastics manufacture in 1928. So much success was attained that by 1930 the production of lock sets was undertaken, and to-day there is a range of some 40 different designs. Furthermore, since those early days other articles of plastic furniture have been produced. These include door numbers, door bolts, cupboard catches, wardrobe hangers, capstan heads for stainless steel taps and so on. A wide range of moulded goods will be on show at this stand, stress being laid on knobs and handles for gas appliances.

E. Elliott, Ltd. Castle Bromwich Stand No. Cb413

The story of E. Elliott, Ltd., is one of continual and rapid progress. It is said of them that they are always a little in advance.

Founded in 1910, the firm has been occupied for many years in the production of articles in Erinoid, Galalith, and similar materials, and as soon as the Bakelite moulding process was introduced a press was installed to try this "new idea." It was not long before they had 20 presses, and when that plant became inadequate they tore it all out and equipped a new factory with 40 of the most modern type.

Even this did not enable them to cope with the demand, so they bought the moulding section of Messrs. Harrison (Birmingham), Ltd., which was splendidly equipped with 26 fine presses, in a layout practically identical with their own at Summer Lane.

Then came injection moulding, and E. Elliott, Ltd., was one of the first firms to install an automatic injection moulding machine. Here again, progress was rapid, and they now have six injection moulding machines, on which they are producing a variety of articles.

These developments demanded more space, and as labour was difficult to obtain in Birmingham, this always enterprising firm opened a factory in Walsall "where the labour was coming from."

At this stand there will be seen a wide range of articles which have been moulded for customers. They will include injection mouldings in cellulose acetate.

Lacrinoid, Ltd., at Castle Bromwich Stand No. A.526a

We have received the following communication from this company:—

"The British Industries Fair for 1938 provides us with an ideal opportunity for the announcement of many new developments in the products of this company, as our activities now embrace the use of the whole range of plastic materials.

"The business was founded in London some 20 years ago for the purpose of manufacturing buttons, buckles and dress ornaments in casein (artificial horn). It was then considered to be a pioneer venture, as these articles were previously made from real horn, celluloid and cloth-covered metal, but the success of our endeavours was very soon established and necessitated removal in 1925 to larger premises in Forest Gate.

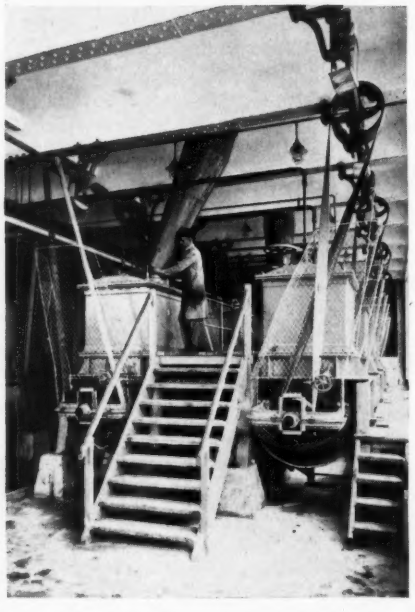
Mr. Alexander Bernstein, Founder and Managing Director of Lacrinoid, Ltd.

"With the development of plastic research it was found possible to include among our products such articles as furniture handles, door handles, motorcar fittings, electrical accessories, fancy goods, etc., and the ever-increasing demand for its products, both for home and overseas markets, necessitated a further expansion in 1935, when the company acquired the present factory at Gidea Park, Essex, covering an area of 3½ acres, and now employs over 400 men and women."

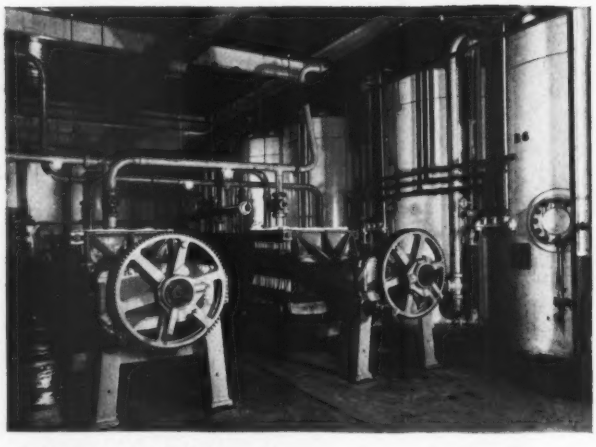
Examples of all their manufactures will be on view.

Wood pulp ready for treatment with caustic soda.

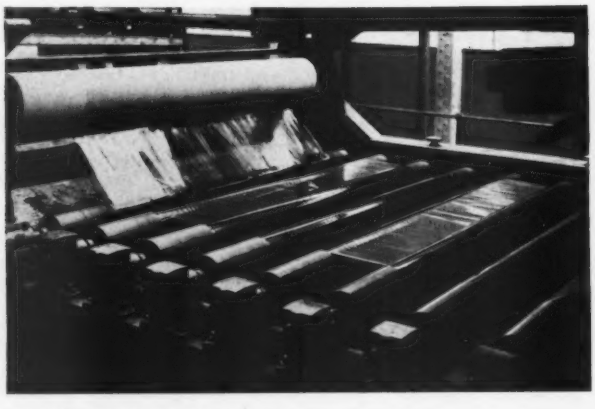
(Right) Shredders containing batches of shredded alkali cellulose.



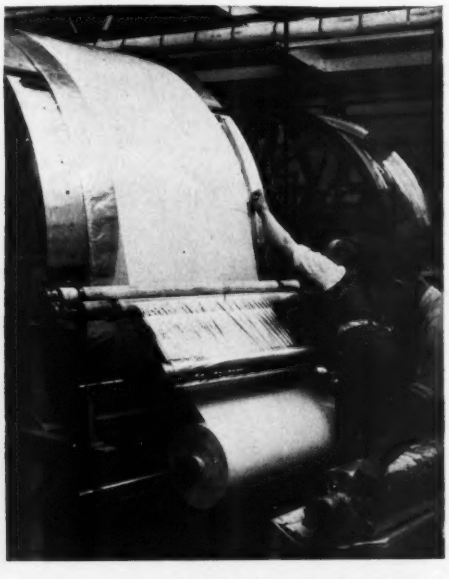
Mixers showing charging of xanthate, made by mixing alkali cellulose and carbon bisulphide.



Xanthate is dissolved in caustic soda, filtered in these filter presses and "ripened" in the storage tanks.



Section of casting machine showing film in course of manufacture passing through chemical bath.



Sheeting drum showing film of "Cellophane" being unwound from roll and interleaved.

The production of "Cellophane" film at the works of the British Cellophane Co., Ltd.

WHAT PLASTICS ARE

VI.—Cellulose and its Derivatives

By H. COURTNEY BRYSON

CELLULOSE, together with its derivatives, especially its chemical combinations with acids, termed esters, form a most important branch of the plastics industry, and one which is likely to increase at a greater rate than that of any other plastic.

The problem of the simple synthesis of the cellulose molecule is one of interest, but it is probable that mankind will always find it cheaper to let Nature do the greater part of the work in the way of growing cotton and wood and then effect subsequent improvements. Viscose silk and transparent paper are the two outstanding examples of what is known as regenerated cellulose. The cellulose, in the form of purified wood pulp, is treated with caustic soda, pressed, shredded into crumbs and the resulting mass placed in rotating hexagonal boxes, where it is treated with carbon bisulphide, which converts the alkali cellulose into cellulose xanthate. This latter is treated with caustic soda to form a treacly solution, which is aged in large storage tanks and filtered prior to squirting through holes or slots into an aqueous solution of acid and salt to form threads or sheets. The acid reacts with the caustic soda in the viscose and the cellulose is regenerated as a tough, transparent solid. It will, therefore, be seen that "Cellophane" film and viscose rayon yarn are identical in constitution.

The plain transparent paper, which is generally slightly less than one-thousandth of an inch thick, absorbs moisture and expands in a damp atmosphere. In a dry atmosphere the reverse takes place.

The paper may be rendered moisture-proof by varnishing with a special varnish. The appearance is unaltered.

No heat-hardening cellulose derivative is known at present—all are thermo-plastic.

The two important esters of cellulose are the nitrate and the acetate.

Ever since the discovery in 1889 that, by the addition of camphor to the brittle, nitrated cellulose, strong, transparent and mouldable celluloid could be produced, the industry has gone steadily forward till recent competition from other materials has shown that almost all the advantages of celluloid could be obtained without the fire risks associated with the latter. It is particularly dangerous on account of the fact that, containing, as it does, such a high amount of oxygen, it can burn in the complete absence of air.

Cellulose acetate made from cotton, acetic acid and acetic anhydride, often known as non-flam celluloid, is more plastic, equally transparent and is not inflammable. On the application of a flame it melts and burns with a certain amount of difficulty. It reaches the market in the form of moulding powders or in sheets up to $\frac{1}{4}$ in. thick, which can be shaped and cut on warming. It may be readily pigmented and the properties of the resulting product varied by the incorporation of different plasticizers and modifying agents. Cellulose acetate is considerably softer than celluloid and, therefore, more readily scratched. It is extremely easy to mould by almost any process and lends itself particularly to injection moulding. The multi-coloured, thin, transparent gramophone discs, so popular a few years ago, were all made from cellulose acetate at the rate of six pressings per minute.

The water resistance of cellulose acetate is poor (of the order of 8 per cent. absorption), and it is somewhat unstable on storage.

The benzyl derivative prepared by acting on cellulose with soda and benzyl chloride is made in this country and in Germany, but not in the U.S.A. Like all the other derivatives of cellulose, it may be prepared in a number of different grades, depending on variations in the details of processing. Benzyl cellulose is more flexible and not so hard as the nitro derivative,

The polishing of thick sheet plastics on metal plates with a mirror surface.
(British Xylonite Co., Ltd.)

and is very stable, particularly towards light and alkalies and acids. It is unaffected even by ultra-violet light or by hot caustic alkalies. The hygroscopic properties are excellent, as well as the resistance to ink, rendering it suitable for fountain pen barrels. It is soluble in cheap solvents and may be used as either the principal or a subsidiary constituent of lacquers where the valuable combination of properties just mentioned is required. Since it may be heated to

180 degrees C. without fear of decomposition, mouldings may be reproduced with the very greatest accuracy. The tendency to warp is negligible. Although benzyl cellulose may be very readily moulded by compression, especially if tools for heating and cooling are employed (of gramophone-record manufacture), by far the best method of moulding is by using the injection principle with a temperature of, say, 150 degrees C. It must be remembered that the hot plastic material is squirted from the cup through the injection nozzle into the die under high pressure, and this pressure tends to open the tool, unlike ordinary compression moulding where the applied pressure keeps the tool shut. This is the chief reason why the extremely high rates of production possible with injection moulding (200-300 cycles per hour) have not been used to obtain large articles.

The extremely valuable combination of properties exhibited by benzyl cellulose, when widely known, will undoubtedly lead to great developments.

Ethyl cellulose is at present made in the U.S.A. and in Germany by reacting on cellulose with ethyl chloride and caustic soda. Its properties are rather similar to the benzyl derivative. It is very resistant to alkalies and to water. It may be injection moulded, but usually a rather higher temperature is required. It is soluble in cheap solvents and has excellent film-forming properties. Good "combination lacquers" can be obtained in conjunction with glyptal resins or drying oils. Ethyl cellulose possesses less gloss, yellows less and is somewhat harder than the benzyl derivative. Both have less tendency to crack than the nitro of the acetyl derivative.

Water-lubricated Bearings

We have received from Francis Shaw, Ltd., of Corbett Street, Manchester, a pamphlet published under the above heading. It deals with bearing material made of synthetic-resin-bonded fabric, a new and interesting development on the part of this firm, which is so well known for the production of presses for the plastics industry and of a wide variety of machinery for the rubber industry.

This new bearing material has been tested on steel rolling mills, paper mills and other applications with great success. The claims are based on this experience and on the fact that the company supplied a battery of rubber-plantation washers three years ago with bearings of this material, and have since had the pleasure of supplying a further three batteries to the same company.

The main advantages are:—

1. Four times longer life than phosphor bronze or other metallic bearings.
2. Reduction in power due to the low coefficient of friction of water-lubricated bearings compared with oil-lubricated metal.
3. Saving of spoilt sheets through contact with grease on the roll faces.
4. Savings in oil and grease.
5. Inability to score the roll necks, even with excessive heat.

Bronze or other metallic bearings are composed of hard crystals embedded in a soft matrix. Properly lubricated, these crystals carry the bearing load very well, but when the lubricant becomes thin or fails, or some other trouble arises that causes the bearing to run hot, then these hard crystals tear at the roll necks and, as the heat increases, the softer matrix recedes and conditions become worse. With this new type of bearing material there are no hard crystals to score the roll neck, and the worst that can happen is a carbonizing of the surface of the material without damaging the roll neck, but which may cause more rapid wear of the bearing.

The amount of water required varies with the load and the speed, but there should be sufficient to prevent the surface temperature rising above 300 degrees F. For the most efficient working the temperature should not exceed 200 degrees F.

This material is practically non-absorbent and is, therefore, not affected physically by water, oil or other ordinary solutions. Thus the bearings undergo no change or deterioration, whether idle or in service.

Where batteries of machines are driven direct by an electric motor, a solenoid valve can be fitted to open or close the main water valve to the battery, operated by switching on or off the current to the motor. This saves water through forgetfulness on the part of employees.

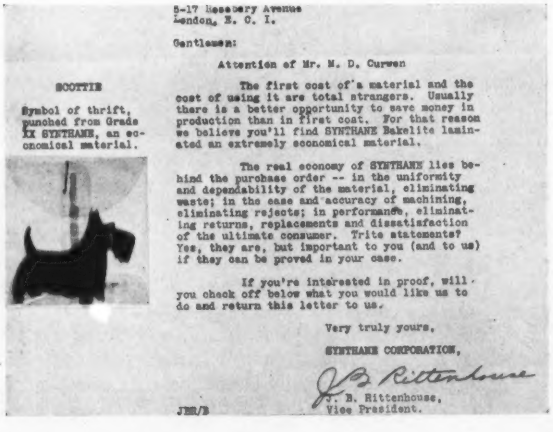
Existing machines can be converted, but it is necessary to install new bearing blocks fitted with this new material and machined for water lubrication.

Now the Plastic Cistern

The "Nilcrode" flushing cistern, distributed throughout Great Britain by J. D. Stoward and Co., Ltd., is reported to have met with excellent reception by architects and master builders. The advantages of using a plastic moulding for cistern shells are now becoming well known. The new cistern is attractive in appearance, light in weight, rustproof and, being seamless, is leakproof and generally reliable. In addition to all these assets, it has been shown that the "Nilcrode" cistern is frost-proof, and the sides are tapered so that ice can rise freely.

Advertising Plastics

Once again we have received a letter from Synthane Corporation, an amusing example of advertising laminated materials.



5-17 Rosebery Avenue
London, E. C. I.

Gentlemen:

Attention of Mr. M. D. Curwen

SCOTTIE

Symbol of thrift, punched from Grade IX SYNTHANE, an economical material.

The first cost of a material and the cost of using it are total strangers. Usually there is a better opportunity to save money in production than in first cost. For that reason we believe you'll find SYNTHANE Bakelite laminated an extremely economical material.

The real economy of SYNTHANE lies behind the purchase order -- in the uniformity and dependability of the material, eliminating waste; in the ease and accuracy of machining, eliminating rejects; in performance, eliminating returns, replacements and dissatisfaction of the ultimate consumer. Trite statements? Yes, they are, but important to you (and to us) if they can be proved in your case.

If you're interested in proof, will you check off below what you would like us to do and return this letter to us.

Very truly yours,

SYNTHANE CORPORATION,

J. B. Rittenhouse

J. B. Rittenhouse,
Vice President.

JBR/B

Latex for Canning

A large number of cans are now sealed with latex, and during 1936 the equivalent of 1½ million lb. of dry rubber, representing some 450 million cans, was used in the canning industry. The process is very economical, as only 100 milligrams of latex is necessary to effect a perfect seal.

Synthetic Rubber for Typewriters

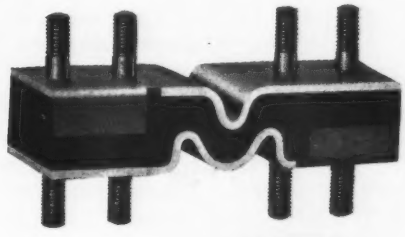
As typewriter stencil papers contain certain mineral oils which attack rubber rollers and platens, one well-known American manufacturer now coats these rollers with "Thiokol" synthetic rubber. It is claimed that the use of this material prevents all deterioration of the platen by oils, and therefore greatly increases the life of the machine.

The use of "Thiokol" for typewriter platens would be welcome in many offices.

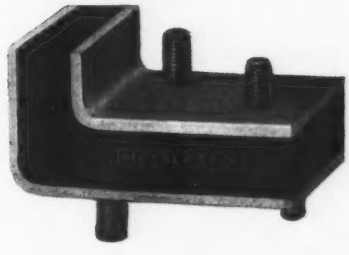
New Industrial Process for Bonding Rubber

In the Metalastik process, rubber is indivisibly attached to metal. This process is not merely one of "sticking together"; instead, technicians of the new company, Metalastik, Ltd., an associate of John Bull Rubber Co., Ltd., have succeeded in effecting a complete homogeneous fusion of the two substances. So strong is the joint between rubber and metal that under tensile stress the rubber will tear before the joined surfaces show the slightest sign of parting. The Metalastik process has been extended to cover the joining of aluminium and rubber as well as the use of synthetic rubber for application where heat, oils and oily vapour cannot be avoided.

Many important applications have been found for the new rubber-metal material; for instance, bearers, brackets, pads and bushes of bonded form can be used for mounting oil engines in transport vehicles, power houses and aircraft. Owing to the action of the rubber, vibration and noise can be considerably reduced. All who are troubled with noisy engines, plant or machinery are invited to bring their problems to the Metalastik experts at their new works in Leicester.



Metalastik mounting for heavy engine.



Metalastik mounting for general purposes.

Rubber Pavilion at Empire Exhibition

The Rubber Growers Association has arranged for the reservation of an area of some 4,000 sq. ft. for the erection of a rubber pavilion at the Empire Exhibition, Glasgow. The rubber pavilion will be located close to the Palace of Engineering and alongside one of the main avenues. On the ground floor it is proposed to stage an exhibit which will illustrate the story of rubber from the growth of the rubber tree to the actual applications of the product in various branches of industry, transport and sport by means of working machinery and models, glass transparencies, coloured illustrations and specimens.

Rubber Protects Fruit

According to C. W. Ellenwood, leading horticulturist at the Ohio Experiment Station, the use of sponge rubber cushions on apple-grading machines would prevent the present serious loss due to bruising and subsequent decay. Studies carried out at the station demonstrated the excellent commercial possibilities of sponge rubber for this purpose.

IS IT WELL DESIGNED?—II.

By J. P. Gowland

WE must admit that the standard of plastic design generally is pretty bad. Rarely do we find technical faults in mouldings, for the technical people in this country know their jobs very well indeed. To them must be given the credit of much research work and new developments of all kinds, but to them also must be attached some of the blame for the existence of imitation leather effects, imitation wood colours, poor lettering, and general shoddy appearance. They are to blame, these purely technical people, not because they do not know the difference between beautiful shapes and poor shapes, good lettering and bad, but because they are trying to do a job of work for which they have had no training.

Art training does not make an artist, although we are all well acquainted with advertisements which say, "If you can write, you can draw." You see, there is a vast difference between good draughtsmanship and a sense of design. Probably Raymond Loewy cannot produce beautifully drawn portraits, but he certainly has a sense of beauty of line, mass and colour, which has been developed by his training and experience. The man with this sense of design can acquire, by training and practical experience, a knowledge of the plastic processes in order to design efficiently. On the other hand, the engineer cannot be trained to become an artist. No engineer need be ashamed of his inability to draw beautiful lettering or design articles which please people, for it is just as much an accident, over which we seem to have no control (yet), as the fact that I call myself a designer and have to work to make a living, and Lord Somebody was born with a receding chin and £50,000 a year.

What have the art schools of this country done to raise the standard of mass-production design? They have made little or no attempt to supply designers for industry. You will find on examination of their prospectuses that they teach design in relation to pottery, weaving, bookbinding and leatherwork. I doubt if you will find anything relative to plastics. It is true the Board of Education has an examination called "Industrial Design," and they do mention that designs must be made for a particular process. That is all very well, but where will the student get his information about modern mass-production processes? Who will help him to understand even elementary things about plastics? I doubt if there is a single design master in an art school in England with a comprehensive knowledge of plastics. A well-known master of design in one of our art schools said to me when I mentioned plastics, "Oh, yes, that stuff made from milk." So he summed up in seven words his knowledge of one of our most important mass-production processes. This man, responsible for dozens of design students each year, is only acquainted with weaving, bookbinding, leatherwork and repoussé metalwork. With the exception of weaving, each subject is of little use to the manufacturer.

Quite likely, then, the manufacturer has got tired of the futile attempts of the young art student to design for plastics. The student is not to blame. The art schools of this country are mostly controlled by picture painters, who do not encourage students to concentrate upon the needs of the mass-production industries. We still hear them say, as though it were a disease, "Mass production—oh, terrible things they make." They still do not realize that it is a finer thing to produce really well-designed articles for the million than one or two expensive "arty crafty" works for Mayfair. They are gradually dying, these teacher painters, for that is how we get rid of them. They hardly ever retire. They hang on to their ideas of student days as determinedly as they do to their jobs.

The industrial designer is gradually coming into his own. A few years ago the average manufacturer would not have even considered outside help in the production of new ideas, but to-day the most progressive concerns never go ahead with a new line until they have either consulted the designer or have given him the complete designing job to carry out.

The method of payment for work varies considerably here and in the U.S.A. In most cases a particular designer's services are secured for a product, or series of products, by paying him a yearly retaining fee, and a further price for each job commissioned. The size of the manufacturing concern and the variety of goods they manufacture has everything to do with the amount paid. A retaining fee prevents a designer from working for any other company manufacturing the same or similar articles and may cover not only designing, but patentable ideas. No industrial designer worth his salt can avoid the introduction of new mechanical methods of doing things in the course of his job, which is, of course, mainly concerned with the appearance of things.

The method most popular in the U.S.A. seems to be the payment of a flat fee to cover all work, and sometimes a small percentage may be paid on sales. Incidentally, the fees received by U.S.A. designers are much higher than those paid in England.

These remarks so far have applied only to the consulting designer, who may be retained by two or more entirely different manufacturing organizations. The man who is working with the manufacturer as a paid employee, a member of the staff, is on a different footing altogether. His whole time is spent with the product, and his drawing office may be part of the engineer's drawing office. The noise of the factory and the routine of the regular job may have a very cramping effect upon this whole-time designer's ideas. There is a danger, too, of the whole-time designer losing that most valuable of all the qualities—independence. Unless the designer is given the status of an executive his services are not being used to best advantage. Too frequently the business executive suggests alterations to the appearance of designs put before him for purely personal reasons. Quite common are remarks such as this, "I wouldn't buy such a queer-shaped article; would you, Miss Brown?" consulting his secretary, who has to keep her job, and quite naturally agrees with

him. In all probability this particular managing director's house is a reflection of his archaic ideas—full of imitation Tudor furniture and "repoussé" brass plaques, pressed in Birmingham and given a "nice" antique finish to be in keeping with his furniture and leaded windows.

Here is the designer's opportunity to be strong—to persuade the manufacturer to put into production, without alterations, his designs. If he is a regular member of the manufacturer's staff there is a danger that he will be afraid of losing his job as designer, and so takes the line of least resistance and agrees to submit another design—to make a compromise. Now, this is very bad. We must assume that the designer is employed because he knows his job. The average manufacturer is too apt to follow the style of his competitors' goods, and any great deviation gives him a shock. He wants a design to be the same in general appearance—yet different! Entirely new features are not welcomed except by executives of vision. The rising sales of their products definitely prove their wisdom in giving the designer a free hand. The wise manufacturer to-day makes use of the industrial designer, whose job it is to know the trend of design and to be one jump ahead. The wise designer is ready to collaborate with the technical staff, but is too strong to be bluffed into making alterations to his designs for purely personal, imitative reasons. If he is employed as a consultant his ideas are received with greater complaisance, but if he is a regular member of the staff he must always be conscious of his weak position.

Redesign pays. There is ample evidence that the industrial designer is an absolute necessity to the manufacturer. Imitation of competitors' articles is of little use to the producer, but unfortunately is very common. If several manufacturers are making similar articles, it is obviously true that they are merely competing upon a price basis, which means cutting and the consequential small profits.

How the Designer Works

There are occasions when the designer is approached by the manufacturer to produce something new without foolish restrictions; but very often, on going into the matter, the designer finds that what is wanted is "something different yet the same," which is impossible, of course. I am not suggesting that a designer should be allowed an absolutely free hand. In the case of a complicated redesign job, requiring several mouldings to make the complete article, it may be necessary to alter the form of the major shapes only, so that the rest of the parts "fit in." Moulds are expensive, and the designer must have one eye on costs if he is to succeed with the manufacturer.

The procedure after discussing the new project with the manufacturer is the production of a number of roughs incorporating the various requirements of the technical and sales departments. In most cases a rough clay model—full size if possible—will help both the designer and the manufacturer. I still maintain that even the experienced designer cannot accurately visualize the effect of his drawing until it reaches the model stage. The manufacturer is apt to say there is no necessity for a model, that he can understand even a rough drawing. The rough full-size model immediately suggests modifications and saves a great deal of time, which in my experience is so valuable. Most jobs are rushed through at high speed, sometimes due to the slowness of the manufacturer to make a decision, sometimes due to bad administration, and very often to under-estimating the time required for the work.

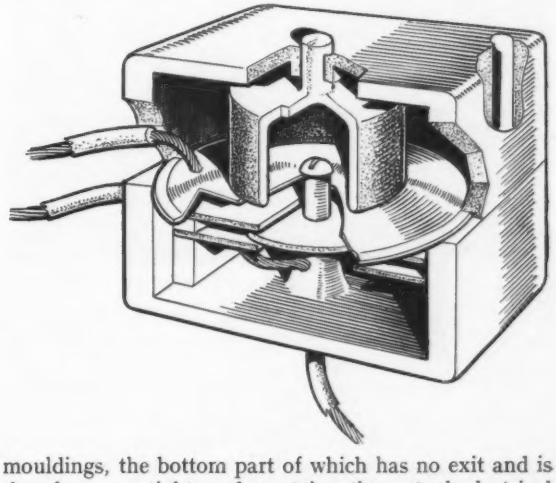
The designer is now able to get on a little farther. He may decide to make a working drawing of the proposed article, and then have an accurately constructed full-size model made in some suitable material. Large models can be constructed of wood or plaster, and are easily cellulose sprayed to give a very good impression of a plastic moulding. Smaller articles need a finer grainless material, such as cast phenolic resin, which is easily sawn and turned, and is obtainable in most colours and tints and transparent. Casein, cellulose acetate and hard woods are also most useful to the designer for making models to show to his clients.

The making of an accurate model is very often not an expense, but an economy, for when a mould is made it is expensive to alter. I doubt if any new job goes right from the designer's drawing board to production without some minor alterations having to be made. This is not due to inefficiency on the part of those concerned, but often to a building up of ideas. Finality is eventually reached, and the designer produces a working drawing of the article.

Bakelite for Vapour-proof Switch

The H-C vapour-proof switch is an interesting little device which will be welcomed by designers of electrical equipment and control gear. It should find valuable applications in almost every industry, for example, limiting and safety switches, gauging and counting devices, pressure, thermostatic and liquid level controls.

It consists of a thin beryllium bronze diaphragm cemented and sandwiched between two hollow Bakelite



mouldings, the bottom part of which has no exit and is therefore gas tight and contains the actual electrical contacts. The overall size is $1\frac{3}{8}$ ins. by 1 in. by 1 in.

A Bakelite plunger projects out of the top half and displaces the diaphragm from one equilibrium condition to another by a movement of 2/1,000 in. with a clean snap action, on the oilcan principle, causing contact to be made through the large silver-faced copper surfaces in the sealed-off lower chamber. Oil, moisture and dust cannot reach the contacts, which are consequently preserved from corrosion and deterioration. Other valuable features are the light operating load and small precision movement required.

Ideas—

By the EDITOR

Wall Decorations

At first sight, at any rate, it seems as if the plastics industry is missing a useful little market in the decorating trade. While rubbing my nose the other day against the window of a well-known wallpaper shop in the West End, I noticed some exceedingly interesting wall decorations. I reproduce a specimen herewith. Others were armorial in shape, some purely "classical" in design. On inquiry within, I found they were not of ordinary papier mâché but of rag, and presumed to be strong. On the whole, the texture of the surface was comparatively crude and where sharp points occurred, as in the sail-tip, very weak. They are stuck on wallpapers or panelling with glue and look extremely attractive.

One thing that struck me was that dirt adhered very readily to the material, especially in the grooves, and could not be removed by soap and water easily. Also, with water there is a strong tendency for the whole thing to crumple up and become shapeless. The price

is rather surprisingly high, an 8-in. by 9-in. decoration varying from 2s. 6d. to 5s., according to design and colour. Weight is about 1 oz.

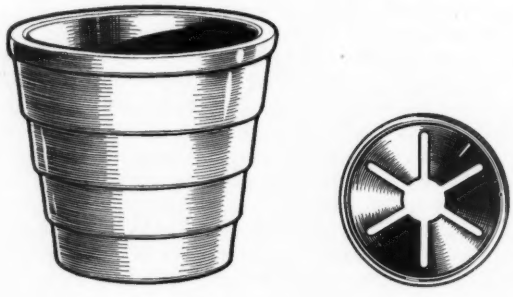
Surely here we have an opening for the plastics industry? The decorations are easily mouldable in the usual press, as there are no undercuts, and the whole is quite shallow. As for appearance, both phenol and amino resins would be immensely superior in finish and could be washed and scrubbed to the heart's content.

Flower Pots

Many months ago I suggested that the flower pot was such a readily mouldable job that it was time the plastics pot was put on the market. I have still hopes of seeing some enterprising manufacturer carry it out. The advantages, I believe, are very great and the disadvantages (such as a slight increased cost over the pottery type) not very important. They are required in enormous quantities, and in an unbreakable condition would be very acceptable.

I think they would also have this advantage. The porous clay pot carries plant disease and fungus for very long periods and is half the reason why poor seeding results are obtained; it cannot be washed properly and often remains unclean permanently. The pot of plastics, on the other hand, would be easy to keep clean and, indeed, sterile.

It has been stated that it is absolutely necessary to have a porous pot for the job. I don't believe it for two reasons. One, that I have tried non-porous clay



pots over long periods with great success for flowers and tomatoes; and two, that more than ever are housewives using the lacquered pot.

I am bringing up this matter again because, while walking in the Strand the other day on my lawful occasions, I saw a pot (as per sketch) which I thought was actually a plastic product, for the shape is a perfect one for the ordinary press mould. About 7 ins. high and 7 ins. top diameter, it was made of clay sprayed with a red lacquer. Price was 2s. 6d. and 3s. 6d. What a feast of design there is for the moulder here! And if he wants a further selling point let him make a novelty for the "hole" in the bottom by introducing a "star," or some such design.

Plastic Trowels

At a recent talk given by Mr. T. Gaunt, of Joseph Tyzack and Sons, Ltd., of Sheffield, he stressed the risk of damage which steel trowels undergo in practice, due to careless workers or to special chemical conditions of the cement. He mentioned that coloured cements which contained acids necessitated the use of a trowel made of special material instead of carbon steel, which rusted easily. It was necessary to use a trowel made of celluloid joined with stainless steel rivets.

This is a most interesting application, and we presume that celluloid (or is cellulose acetate sheet meant?) is well able, because of its high impact strength, to stand the strain. Equally a laminated sheet made from phenolic resins would do. If reasonable care is taken of the trowel there is no real drawback to moulded instruments.

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

The High-frequency A.C. Thermo-hardening Process for Plastics

Mr. A. J. Brajnikoff has kindly sent us the following notes to supplement those we published last month on the above subject:—

As is known, the process of thermo-hardening (or "curing") of plastics, e.g., natural and synthetic resins, rubber, etc., presents many difficult features, which arise from the basic problem of heat transfer through the elements composing the system.

Owing to low thermal conductivity of the constituents the flow of heat is not uniform and the resultant solid does not possess a regular structure. This factor is of special importance in the moulding of large articles, for at the beginning of the process under external heat application, the outer layers of a body receive much higher temperature than the interior mass, the consequence being the heterogeneity of structure, reduced forces of cohesion, uneven distribution of stresses and the weakening of mechanical and other properties of the final product.

The foregoing emphasizes the practical importance of finding the means for rectifying the steep thermal gradient so as to render a more uniform transmission of heat throughout the object.

One of the most convenient and promising tools for this purpose may be the action of the high-frequency alternating currents, with the periodicity of the order of magnitude in the neighbourhood of one megahertz ($10—20.10^6$ Hz), by means of which the substance is heated by the dielectric energy losses. The simplest way of realizing the thermo-hardening action in moulding operation is to allow the metal die to serve as one of the electrodes.

If the mixture under treatment includes certain conducting agents (e.g., metallic fillers, etc.), the process may be carried out within a solenoid of suitable size calculated to produce a uniform field.

High-frequency method possesses a series of advantages over the steam or other orthodox modes of curing, the distinctive merits being the regularity of molecular arrangement and hence a better quality product, as well as the acceleration of the operation and therefore increase of output.

Due to simplicity of design and controllable features of the apparatus, its performance, under certain conditions, may offer a definite improvement in the technique of curing plastics.

Although the diversity of technological problems makes it impossible to design an apparatus for universal application, none the less, in many cases the process can readily be adapted to the existing plant equipment.

As a possible extension to other fields mention must be made of its utilization for drying in situ of fibrous substances, such as wood, agricultural products and similar other materials.

Synthetic Glycerine

Those who are concerned in the development or use of the well-known alkyd resins and ester gums which are so widely used in varnish manufacture and which are produced from glycerine as one of the basic materials, will be interested in the most recent research work that has been carried out for the production of glycerine by synthetic means.

Glycerine, which is normally made during soap manufacture from fats, as a by-product, and which formerly sold at £40 to £50 a ton, is now, owing to war demands, selling at £62-£95 a ton, according to purity. In 1930 the material was a drug on the market and, in fact, soap manufacturers were refusing to distil it from the water which contained it. To-day it is in obvious demand in enormous quantities for the production of nitro-glycerine, and explains in part the cutting down of the consumption of natural food-fats for foods in certain countries.

News from the French Academy of Science indicates that it is now possible to manufacture the material easily and (in view of the present prices given above), relatively cheaply, by purely synthetic means. The raw material is acetic acid.

Non-tacky Adhesives

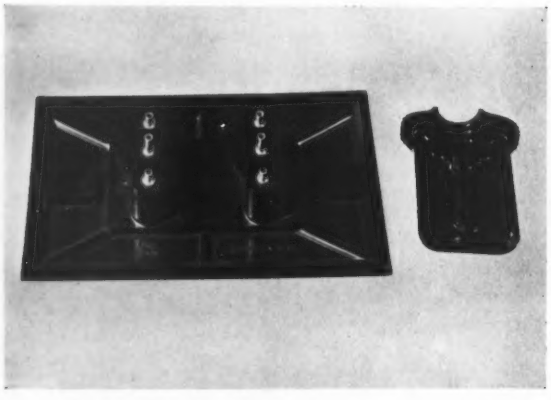
It appears strange, at first sight, that there should be a demand for adhesives that do not stick permanently. There is, however, a necessity especially in such fields as photo-engraving and commercial artists' work where temporary photographic mounting is desired. Simple solutions of rubber in solvent have been used, but a recent improvement on this is described in *Chemical Industries* (U.S.A.) of January, 1938. In this two solutions are mixed, one containing crepe rubber in naphtha, the other being composed of ester gum, toluol, ethyl acetate and butyl acetate. The resultant product can be used for joining together paper, wood, glass, "Cellophane," etc.

FURFURAL

A Raw Material for Plastics Manufacture

IT is now slightly more than 15 years ago that the industrial chemical world first heard that this material, hitherto regarded merely as a curiosity, was about to be produced on a technical scale by the Quaker Oats Company of U.S.A. from oat hulls; in 1922 the first hundredweight drum was shipped. To-day it is bought and sold in tank wagons at a price, in the U.S.A., of 9 cents a pound. Furthermore, at least two more factories, one in Sweden, producing the material from tan bark, and another in Russia, have now been erected.

Furfural, although used mainly in the petroleum and impregnating industries, because of its solvent powers, soon interested the plastics industry in the U.S.A. as a substitute for formaldehyde for the manufacture of synthetic resins of the phenol type. But there are certain differences between it and formaldehyde (both are, of course, what are chemically known as aldehydes) that give furfural a field of its own, although this field is comparatively somewhat limited. For example, its



boiling point is higher than that of the temperature at which phenol and furfural react normally, so that there is no comparable loss as there is when using formaldehyde. Again, the high boiling point allows for easier removal of water as this is formed in the reaction. It is further claimed that since furfural is a solvent for phenolic bodies and also for the condensation products formed, there is no separation of resin, and manufacture of a more even product is obtained.

Resins made from phenol and furfural condensation are converted into powders and mixed with wood-flour or asbestos in the usual way and are moulded by the same technique as others.

There are, or at least were, two important drawbacks to the use of furfural for resin moulding, and both were important. First, furfural reacted at a much slower rate than formaldehyde, and since speed of production is so essential, it was not regarded with much favour. To-day, however, following progress in research, furfural resins can be made to react with adequate rapidity.

Of importance, too, is the fact that furfural resins result in black mouldings and cannot be used for the production of light-coloured materials now so much in vogue for decorative purposes. We presume no change has occurred with time in this respect. In effect, the use of such resins has been confined to objects of technical value only, and obviously enough, the market here is sufficiently large. Furfural resins result in excellent mouldings for the electrical industry, the accompanying photograph showing two mouldings made from them by an American concern.

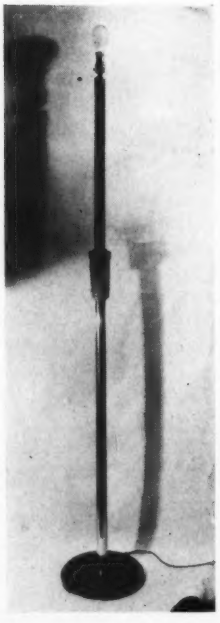
So far we have not encountered in this country the use of furfural for making resins, added to which it must be admitted that the Quaker Oats Company has not given overmuch publicity to the material here.

Purely as a solvent, furfural has an extremely interesting outlet in the manufacture of resin-bonded abrasive wheels. Here it is claimed that no other solvent is so suitable and that it has been responsible for a lowering of the grinding costs of motorcar manufacture.

A derivative of furfural, namely furfuryl alcohol, is rapidly increasing in importance since it has the property of forming resins in the presence of very small quantities of acids. Of special note is the treatment of laboratory table tops with this alcohol followed by an application of dilute suphuric acid. This results in the formation of resin in the cells of the wood giving a surface extremely resistant to water and to acids.

A Modern Lamp Standard

At the stand of Punfield and Barstow, Ltd., at Olympia, there will be seen a new standard lamp in which a successful attempt has been made to improve the somewhat cold effect obtained by utilizing metal as the main standard, especially when this is chromium plated. In the new type, the base is moulded of coloured phenol resin, and half way up there is additional relief by means of a coloured synthetic resin section. Additional ingenuity is introduced by the fact that there is also, within this middle section, a second or pilot lamp which lights at the same time when the main lamp is switched on. Since the middle section is made of translucent plastics and is coloured, the general effect is considerably enhanced and serves to break up advantageously the severe line of the standard. The standard has been patented by Punfield and Barstow, Ltd., and the lamp is distributed by Messrs. Thompson, Diamond and Butcher, of Farringdon Road, London.



The new lamp stand

Inquiries and Answers

Knitting Gauges in Plastics

A lady who wishes to be nameless asks us why knitting needle gauges (one of which she sends us) are not made in plastics, and adds that metal ones rust easily, and pleasant colours would be welcomed. They are sold at 6d., and she claims there must be well over 500,000 women who knit.

[EDITOR'S NOTE: This certainly seems a reasonable little job for someone, and the thought of half a million women knitting should be enough to set our plastic factories agog with excitement! Probably the best job would be done in laminated sheet, and numbering of the gauges in colour different from the base not an economic impossibility.]

Plastics for Artists

Wakefield.

To the Editor, *Plastics*.

Sir,—As a lover of good design in everyday life, I was forced some time ago to take note of the influx of certain articles which I then termed ebonite or Bakelite, and as an art-craftsman in clay, wood and metal I felt a need for further knowledge of these plastic materials. I have used your journal for the past few months and studied certain publications on this work, yet I gather but disappointment, as the medium seems to offer little for the individual craftsman, due to the integral part played by heat and pressure. However, as far as my present knowledge enlightens me, I can see expression perhaps in constructing with manufactured types, e.g., rods, tubes, sheets and tape, but even in this instance I seem to recall that these plastic substances refuse to be "worked" even by tool steel.

Will you kindly consider my problem and forward me your views, together with any concrete suggestions if you feel there is scope for the individual in this medium. B.P.

[EDITOR'S NOTE.—It is true that the materials we term plastics are not suitable for the art-craftsman in the same sense that clay is. Synthetic resins are plastic during the process of manufacture, that is pressing, and are hardened at the same time. Nevertheless, in rod, tube and sheet form they do offer great scope to the craftsman who can use engraving and other cutting tools, as the work of the late Lady Gertrude Crawford, which we published in our September issue, and the work of Mr. Gabo, published in this issue, adequately show.

As far as we know, there is not yet a material on the market which can be moulded by the hand and then will harden automatically in the air to the hardness and strength of the phenol or amino synthetic resins. But we can readily see that a new type of hand-mouldable material may yet be possible. For example, is not the following a possible solution? If fine sand or other material be mixed with a little cellulose lacquer or certain special varnishes containing synthetic resins, it is possible to obtain a soft workable material which, on allowing to air dry or on stoving at comparatively low temperatures, will result in a hard coherent mass resembling stone. The air drying process would take hours or days to harden, depending on the thickness of the object, and would allow time for rapid sculpturing to take place. Probably, however, it would be necessary to allow partial hardening before hand-work on the material could be performed, as for some time after mixing it would not be sufficiently coherent.

While on this subject we should like to mention that a new patent has been taken out by the B.F. Goodrich Co. (U.S.P. 2,048,806) for the production of synthetic resin moulds for plaster casting. The moulds are made from a resilient vinyl chloride resin mixed with a suitable plasticiser or softening agent. The products are water resistant and can be recast.]

Sausage Skins and Tubes

St. Helens.

To the Editor, *Plastics*.

Sir,—There have been reports in the dailies of the production in Germany of sausage skins and collapsible tubes for dental paste from cellulose. Are these facts, and in the first instance is not the chemical cellulose more harmful than the natural skin used normally?

D.M.T.

[EDITOR'S NOTE.—Both statements are probably true, but we should point out that sausage skin made from cellulose, or rather viscose sheet, was first developed in the United States of America some eight or ten years ago. The research work was carried out by the Mellon Institute. We believe the mileage of skin made in the U.S.A. is colossal. As for the effects on the human system, the skin is free from chemicals and we cannot imagine much harm done if the skin is swallowed—at any rate cellulose is not more indigestible than the ordinary sausage skin. And if you are very finicky, you can do as all the best people do, delicately separate the meat from the skin.

The cellulose collapsible tube is probably an effort to do without tin. As we have never seen a cellulose tube we cannot tell how strong it is, but on general principles we should rather see an extruded vinyl resin type than a cellulose one. The normal life of the toothpaste tube should be well over six weeks and, of course, must stand up to the considerable strain of rolling up the end. It is quite possible that the cellulose type may be strong enough for this particular purpose, but we have not yet seen it in the extruded tube condition.]

Addresses Required by Readers

J.H., Streatham: The Armstrong Cork Co. (Plastics Division), Lancaster, Pa., U.S.A.

A.L., Salisbury: Monsanto Chemicals, Ltd., Victoria Station House, London, S.W.

G.T.C., Birmingham: The information is published in the annual review of the Department of Scientific and Industrial Research. This can be obtained from H.M. Stationery Office, Kingsway, London, W.C. Sir Gilbert Morgan is Director of the chemical laboratories at Teddington.

TRADE AND PERSONAL NOTES

High Award to Inventor of Bakelite

The Messel Medal of the Society of Chemical Industry has been awarded to Dr. L. H. Baekeland, of the United States. Dr. Baekeland has lived to see the plastics industry, which he founded by the invention of Bakelite, turn over many millions of pounds a year, with his own name perpetuated in the name of the commodity.

The Messel Medal, one of the greatest honours in the profession of chemistry, is awarded every two years to one who has attained meritorious distinction in science and its application to industry.

The medal will be presented in Ottawa on June 21 during the annual meeting of the Society of Chemical Industry, which takes place this year in Canadian centres.

At the Royal Aeronautical Society annual reception, held on January 19, the Simms Gold Medal for the best paper of the year was presented to **Dr. N. A. de Bruyne,** for his paper on plastic materials in aircraft construction.

P. B. Cow and Co., Ltd., have appointed **Mr. J. W. Walker** as Mechanical Press Moulded Goods Representative.

The telephone number of **Injection Moulders, Ltd.,** Westmoreland Road, The Hyde, London, N.W.9, is now Colindale 8868-9.

Semtex, Ltd.

Interesting developments in rubber flooring are being undertaken by Dunlop Plantations, Ltd., a subsidiary of the Dunlop Rubber Co., and the Limmer and Trinidad Lake Asphalt Co. These companies have formed a jointly owned subsidiary, Semtex, Ltd., which will manufacture a new type of plastic rubber flooring.

Explosion at Du Pont Synthetic Rubber Plant

Severe damage was done to the Deep Water, New Jersey, factory, which produces synthetic rubber for the American market. According to a late report, two workmen were killed, another seriously injured, and the damage is estimated at $400,000.

Mr. G. N. Higgs, the Plastic Consulting Industrial and Research Engineer, will be in attendance at the British Industries Fair and will be pleased to arrange appointments at the stand of the British Plastics Federation (No. A.711).

He informs us that he has lately obtained some most interesting and satisfactory production results by instituting new standardization and interchangeability schemes on both compression and injection plant, combined with a new variable quantity works order system, arranged specially for the use of Custom Moulders. He has also a number of new layout schemes on hand for high-speed output and automatic control, operating with specially designed ls for this purpose.

The Solus, Teoranta (Light), Ltd., the well-known Dublin manufacturers of electric lamps, plastic and neon signs, have appointed **Mr. G. Turner, B.Sc., A.I.C.,** as their new general manager.

A well-attended joint meeting of the Birmingham and Midland Section, the Plastics Group of the Society of Chemical Industry, and the Institute of the Plastics Industry, was held at the James Watt Memorial Institute, Birmingham, on January 14. Mr. P. K. Chance was invited to take the chair at this meeting, which was the occasion of a lecture by **Mr. H. V. Potter, B.Sc.,** entitled "The Economics of the Plastics Industry."

The Department of Overseas Trade announces that **Sir Louis Beale** has been appointed Commissioner-General for the United Kingdom Section of the New York World's Fair, to be held in 1939.

His Majesty the King and members of the Royal Family will visit the British Industries Fair at Olympia on the morning of February 22, and at Earls Court on the following morning.

At a meeting of the **Committee of Management** of the **British Soya Bean Growers Research and Development Society,** the conclusion was reached that further experiments are necessary to ascertain whether the yield per acre can be increased, as only in this way can the soya bean be grown profitably in this country.

Lord Melchett has nominated the **Marquess of Reading** to act as his alternate on the board of Imperial Chemical Industries during his absence owing to illness.

The **Leipzig Spring Fair** will be held this year from March 6 to 14. Extensive additions are being made to the accommodation available to exhibitors. The London office is at First Avenue House, High Holborn, W.C.1.

Mr. J. E. Beard has resigned his post as general manager and director of Catalin, Ltd.

Mr. William R. Gordon has been appointed commercial manager of Low Temperature Carbonization, Ltd., as from January 17, 1938.

The British Commercial Gas Association, Gas Industry House, 1, Grosvenor Place, London, S.W.1, has issued a most useful booklet, entitled "The Control of Gas Fired Plant," which is No. 10 of the series Industrial Uses of Gas.

It contains an analysis of the problems to be solved, description of the principles adopted in the design of control gear, drawings and technical descriptions of representative equipment, and photographs and full details of a large number of installations in everyday use. It is, in fact, almost a text book on the subject, and as such it is of considerable interest to moulders who use gas as a source of power.

The Commercial Solvents (Great Britain), Ltd., remind us that their new booklet, entitled "Alcohol Talk No. 1," is now available and readers interested and desiring copies should apply to the head office, Aldwych House, Aldwych, London, W.C.2.

The principal of **Loughborough College,** which is, of course, famous throughout the country for its training in engineering, now informs us that a department of chemical engineering under the direction of G. M. Dyson, Ph.D., F.I.C., A.M.I.Chem.E., has now been formed.

Rumanian Government Grant for New Chemical Works

The State-owned nitrogen works at Diesosgentmaron are to be given a Government grant amounting to 120,000,000 Lei, approximately £170,000.

A. Boake, Roberts and Co., Ltd., have declared an interim dividend of 1½ per cent. tax free, payable January 5.

The **India Rubber, Gutta Percha and Telegraph Works Co., Ltd.,** report for the year to September 30 last a net profit of £54,126 (against £66,137), plus £16,126 brought in. Fixed 6 per cent. dividend and additional 2 per cent. on preferred ordinary takes £12,000; fixed 6 per cent. and additional 3 per cent. on ordinary, £9,000; preference dividends, £13,750; forward, £35,502.

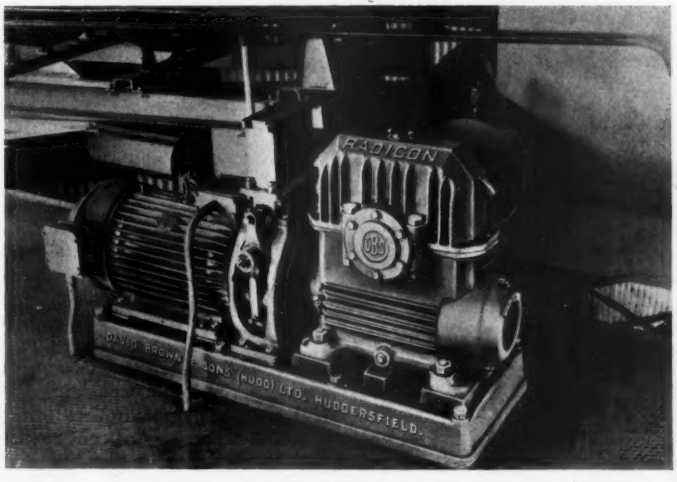
NEW MATERIALS—NEW PLANT—NEW METHODS

Power Transmission by "Radicon" Worm Reducer

The rapidly widening field of the plastic's industry, both in the range of plastic materials produced for use in other industries and in manufactured articles, necessitates the extension of existing production facilities in many factories.

Where increased output is desired, close collaboration with experienced power transmission engineers will undoubtedly result in a more efficient production flow. Frequently a gear specialist can see a good opportunity for group or independent motor drives and thus prevent the wrong type of drive being installed.

Every minute lost to production increases the cost of the finished article, and for this reason the adoption of "Radicons" to reduce the speed of driving motors to machine speeds is to be recommended where economical trouble-free transmission is required.



In many trades and in increasing numbers in the plastics industry, at home and abroad, "Radicon" worm reducers manufactured by David Brown and Sons (Hudd), Ltd., are being used for driving mechanical washers, conveyors, centrifuges, kneading machines, presses, extractors and the many other machines used in the plastics industry. This is particularly the case where, owing to the ever-increasing numbers of new plastics, special machines have to be designed for their manufacture, and, due to its compactness, the "Radicon" unit may be readily built-in to form an efficient and silent drive.

Four types are available, having ratios between approximately 5 to 1 and 60 to 1. These comprise models for horizontal drives at right angles, with the wormshaft arranged either above or below the wheel, for vertical drives either upwards or downwards and self-contained motor-driven units.

Reduction is obtained by the means of "David Brown" patent worm gears, which are carried on ball or roller bearings. The wormwheel consists of a Taurus bronze centrifugally cast rim shrunk and pinned to a cast-iron centre. The worm, integral with its shaft, is of nickel steel.

"Radicon" units are cooled by means of a radial fan, mounted on an extension of the worm shaft, which directs cooling air over fins on the worm casing. The upper half of the casing is provided with vertical fins to assist cooling.

Grease lubrication demanding regular attention is entirely eliminated. The wormshaft carries oil flingers, which transfer a liberal amount of oil to the wormwheel, providing adequate lubrication for the teeth. Oil from the wheel rim is led from collectors to a trough, which communicates by drilled holes to the bearings. Oil leakage is prevented by double-walled oil catchers, baffles and seals.

"Radicon" worm geared motors provide a highly efficient, self-contained combination of motor and high-duty worm reduction gear suitable for group or independent drives. Gears can be mounted independently of the driving motor or both can be arranged on a cast-iron or a fabricated bedplate to suit practical erection requirements.

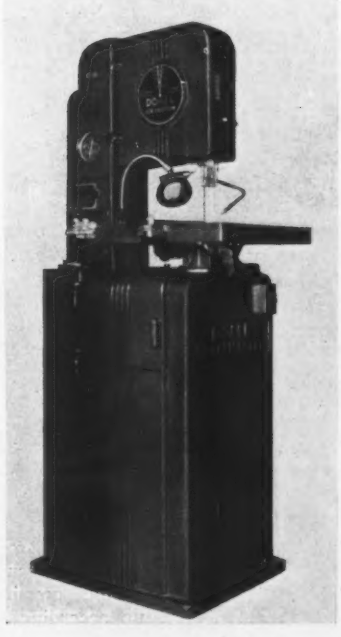
No bedplate is required for the geared motor units.

Contour Sawing for Plastics

With this new Contour machine the saw band or file band may be inserted through a starting hole and rejoined for continuous internal work. Contour sawing and filing is especially adapted for the shaping of plastics and plastic lettering made in this way is now finding many uses for display and advertising layouts.

This precision machine is designed by Continental Machine Specialities, Inc., Minneapolis, U.S.A., for the cutting of contours by the use of accurately guided band saws. It is also suitable for finishing work by means of file bands and grinding and polishing with abrasive bands.

While based on the familiar conception of a standard band sawing machine, this Continental development embodies many advanced ideas in machine-tool design, including features entirely novel in character. The frame is styled to clothe its inherent rigidity with lines and surfaces pleasing to the eye. Also important from the engineering point of view is its built-in instrumentation; this includes a "job selector," which is visible in the full-length illustration of the machine.



PATENTS RELATING TO PLASTICS

These abridgments of recently published specifications are specially compiled for this Journal by permission of the Controller of his Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet, as issued, on payment of 5s. per group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address, price 1s. each.

471,818. Chlorinated Rubber

WEICKHARDT, L. W., and IMPERIAL CHEMICAL INDUSTRIES, LTD. March 10, 1936.

The packing density of solid chlorinated rubber in divided form is increased by treating it with the vapour of a solvent therefor at a temperature above the boiling point of the solvent at the prevailing pressure and preferably at normal pressure, and subsequently removing residual solvent associated with the chlorinated rubber before any substantial condensation has occurred, e.g., by warming and/or by air blowing. The temperature of treatment is preferably at 10-20 degrees C. above the boiling point of the solvent but is preferably below about 130 degrees C. in order to avoid discoloration or decomposition of the chlorinated rubber. Solvents specified are benzine, toluene, carbon tetrachloride, and trichlorethylene; the solvent vapour may be, but is preferably not, diluted with an inert gas or vapour. The spongy or fibrous chlorinated rubber prepared as described in Specification 402,454, for example, may be treated as above.

471,440. Resinous Coating-compositions

MONBIOT, M. F., and BRITISH RAYOPHANE, LTD. March 23, 1936.

A surface coating-composition, particularly for rendering impermeable textile fabrics, paper, leather, wood and sheets of cellulose derivatives or gelatine, comprises a solution in a volatile solvent of chlorinated rubber 25-45 per cent., a resin 15-40 per cent., a plasticizer 15-25 per cent., and a wax 10-15 per cent. Dammar, glycerol-phthalic anhydride, and cumarone resins are specified, together with paraffin wax, japan wax, carnauba wax and spermaceti. Suitable solvents are gasoline, benzene, toluene, xylene, and mixtures thereof.

472,244. Moulding Artificial Resin

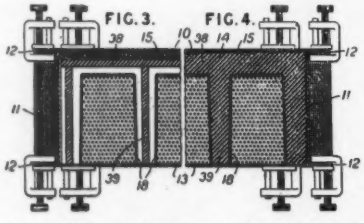
DYNAMIT-AKT-GES. VORM A. NOBEL AND CO. December 14, 1935.

In making grained or veined articles having the appearance of marble, tortoise-shell, horn, wood, etc., from artificial resin by pressing, the usual tablets formed from the pressing powder are divided up according to the desired veining or graining, e.g., by a profiled cutter, and to the parts so obtained there is applied by spraying, powdering, etc., a pigment or pigments, the parts being then subjected to hot pressing to give the article or, more particularly in the case of small articles such as buttons, to form another tablet from which the article is pressed in a mould. In a modification, the pigment is applied to the undivided tablet from which the articles are then made. In a further form, the pressing powder is formed into bars which are divided into small parts which are coated with the colour and formed into tablets which are subjected to hot pressing.

472,646. Sponge Rubber; Moulds

MINOR, H. R. March 26, 1936.

Sponge rubber is made by placing a rubber batch in a closed container, such as an autoclave, forcing in carbon dioxide gas under pressure, raising the temperature, and then releasing the pressure while continuing to raise the temperature to cause vulcanization. The batch may be maintained for a period at a temperature below that of vulcanization, before releasing the gas. The cellular structure may be controlled by varying the final pressure. The batch may include low temperature accelerators. A mould 10 comprises side walls 11 having flanges 12 on which top and bottom plates 14 and 13 may be clamped, all being made of perforated metal or metal gauge. A textile or fine-gauge lining 15 may be provided, also perforated core-pieces 18 to form a sponge block with cavities, in which case the rubber is placed in the mould as a sheet 38, having strips 39 placed across it.



471,904. Compound Glass

MEYER, D. March 11, 1936, Nos. 7367 and 7368. Convention dates, March 25, 1935, and April 17, 1935.

Safety glass is made by uniting, without the use of heat, sheets of glass, one or more of which is coated with a polymerization product such as polyvinyl acetate, in the presence of a neutral liquid which does not dissolve or disperse the coating. Sheets of glass are coated with a solution of polyvinyl acetate, dried, and wetted by immersion or washing with an alcohol such as butyl alcohol or a hydrocarbon such as benzine, after which the wetted coatings are pressed together, e.g., by a roller.

471,755. Polymerized Methacrylic Acid Esters

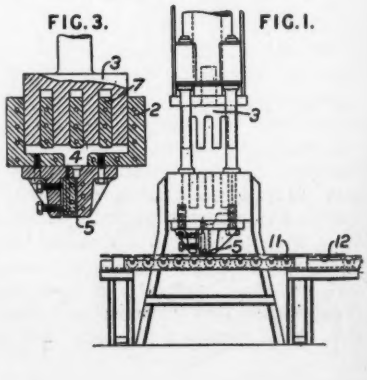
DU PONT DE NEMOURS AND CO., E. I. March 9, 1936, No. 7085.

Granular polymers are prepared from methacrylic acid esters or mixtures thereof, by subjecting them to a kneading operation at a temperature sufficiently high to induce polymerization.

472,114. Extrusion Machines

KAMPFER, A. February 13, 1936.

A press for making plates or foils from polymerization products of unsaturated organic compounds is provided with a pressure chamber 2 which is divided by partitions 7 into a number of compartments leading into a common space 4, which is in communication with an adjustable extrusion outlet 5. The plunger 3 is subdivided to fit the compartments. The partitions 7 and the walls of the chamber 2 and outlet 5 are provided with heating devices. The press may be used for coating glass plates with foils and making laminated products as described in Specification 472,140, for which purpose rollers 11 are provided supporting a continuous band 12 below the outlet 5 and at a distance equal to the breadth of the outlet. The glass plates to be coated are carried on the band 12. Devices may be provided for heating the plates and for coating them with adhesive.



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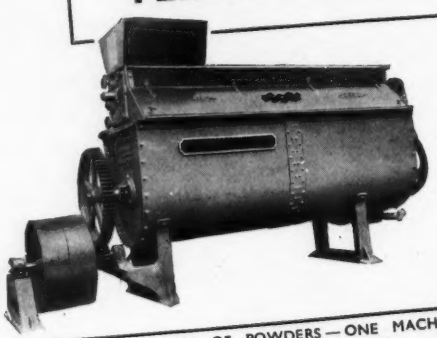

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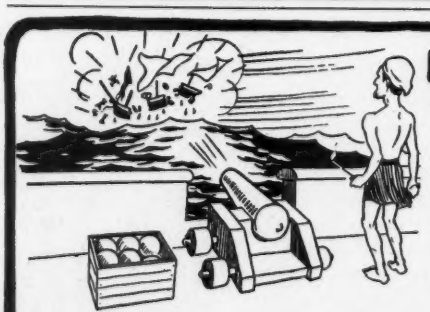

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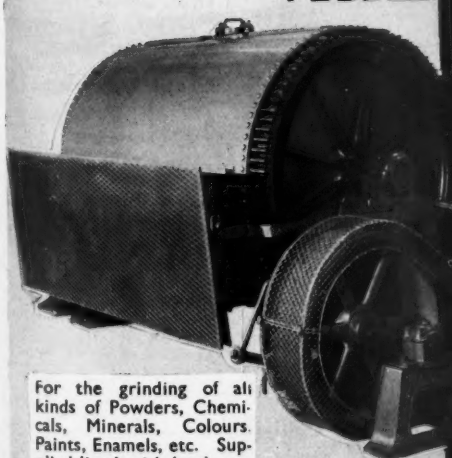

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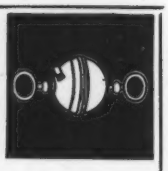

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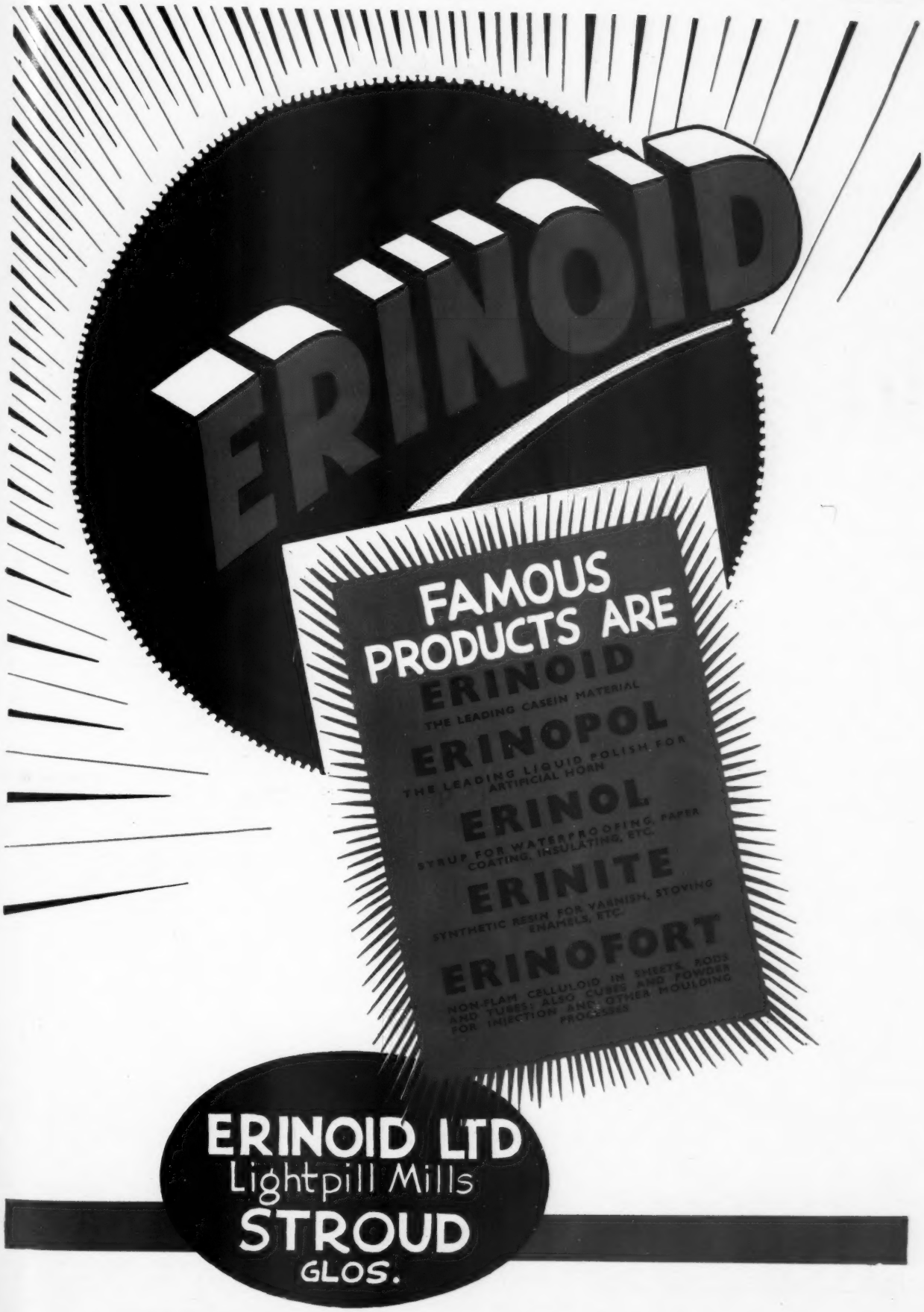
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